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ABSTRACT

Conducted by the State Office of Education in cooperation with IBM Corporation, this study was designed to examine the uses of technology in Utah schools and how the implementation of technology could greatly assist the educational process. Six objectives are specified in Section I: (1) design state-of-the-art technological models to be offered by the state to local districts; (2) expand and improve the "cooperative" information education technology network; (3) develop a plan to integrate the use of technology for instruction and management; (4) identify levels of technology awareness and training needed and develop a plan to meet current and future training needs; (5) analyze current and projected services provided through technology and establish new priorities for new projects; and (6) identify financial and organizational requirements for implementing specified technological services. Section II summarizes the general findings, which are then described in more detail in Section III. The findings include problems concerning inservice training, instructional applications, networking, master planning, electronic mail, fiscal limitations, hardware/software compatibility, and integration/cooperation. Recommendations addressing each problem are examined. Section IV identifies administrative, instructional, and inservice solution models that would benefit public education if implemented, and an implementation plan is outlined in Section V. Sections VI and VII discuss future applications and implications of the study findings. The appendices contain official letters, a methodology checklist, interview schedules, and interview questionnaires. (DB)

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Educational Technology Study

Perspectives on Educational Technology

Utah State Office of Education
September 1987

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Educational Technology Study

October 1987

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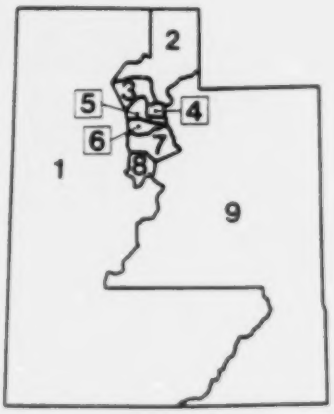

Board Goals of the Utah State Board of Education

I. **Curriculum Reform**
II. **Enhancing Teaching as a Profession**
III. **Vocational-Technical Education Planning**
IV. **Improving Utilization of Physical Resources**
V. **Increasing Public and Parental Involvement**
VI. **Assessment**

Educational technology gives us a powerful tool--more powerful than we have ever had--to transverse the difficult path to excellence in education.

Technology not only gives educators access to greater information and more varied learning resources, but it also has the potential to change the way people learn.

Preface

During the past 50 years, technology has literally changed our society and our lives, bringing us into a new age.

Computers and other information technologies have been an important and integral force in this change.

These technologies have dramatically changed the way business is conducted throughout the world. The quill pen of the accountant has been replaced by high-speed, interactive terminals; the hand-operated crank telephone has evolved into an extremely sophisticated communications system using fiber optics, satellite transmission, and microwaves to flash millions of telephone conversations, television programs, and data simultaneously around the world.

Additionally, these technologies have been largely instrumental in the enormous advances in medicine, transportation, architectural design, manufacturing, agriculture, science, banking, communication, space exploration, and on and on. There are few instances of human endeavor which have not been impacted by technology.

Of all the efforts of any society, the most important is the educating of its populace. The challenge that confronts our education community today is that of finding ways by which the enormous promise of technology, which has been so effective in making business and industry more productive, can be implemented in the educational process to increase efficiency, effectiveness, and equity.

The promises of the past (e.g., instructional television and teaching machines) have failed to produce the desired results, causing many educators to view these and other technological innovations as "fads" or "processes without substance."

Today, amid the vast array of technological innovations which have so significantly changed the very fabric of our lives, many questions remain unanswered: Is it really possible for technology to improve the educational process? Can the capabilities offered by the technology greatly assist teaching and learning? Are there ways to implement the technology to relieve teachers of the burdensome, redundant task of teaching low-order skills and thereby permit them to focus more fully on what students need to know? Can the technology open vast vistas of information and knowledge to students and improve their motivation to learn? Can technology enhance the situations of the slow learner, the handicapped, and the bright and accelerated student through infinite patience or fantastic speed and articulation? Can the instructional process be restructured to be more effective, efficient, and more productive?

Will the implementation of technology in education dehumanize the process and be detrimental to students?

The questions seem endless, and the search for the answers may seem beyond rational thought; but the questions persist, and the groundswell of those seeking answers continues to grow.

Education is at a crossroads. Clearly, the process must change. If public education is to survive as a weaver of the fabric of society, it must incorporate those technological innovations which will improve the productivity of the process and the quality of the product.

This study is intended to explore this great challenge by addressing some of these questions and defining a process by which others will be addressed.

Acknowledgements

This report is the result of not only a substantial level of concern regarding the challenges that face education in a rapidly changing society, but also of a tremendous amount of vision and intuition regarding the ways that technology might be utilized to assist the educational process. The driving forces included improving the quality of the product, as well as implementing ways by which the process can become even more cost-effective. Those who have participated in the preparation of this report have constantly evaluated these criteria in all that has been done.

Study Team Membership

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Utah State Board of Education
Superintendent James R. Moss
Assistant Superintendent Scott Cameron
Governor Norman Bangerter and Staff
Legislative Leaders
Local District Superintendents
Local School Administrators and Staff
Utah School Boards Association
Utah Society of Superintendents
IBM Corporation
Administrators and Staff of the Utah State Office of Education
All Interviewees and Survey Respondents

Without the assistance of the above, the study could not have been conducted.

Lastly, Amy Bradshaw, IBM Marketing Representative, has provided invaluable assistance in the many tasks of the team. Our special appreciation to her.

Section I: Introduction

Introduction

Purpose of the Study

Historical Perspective

It was on July 21, 1969, that Neil Armstrong emerged from his space vehicle to declare as he touched the moon's surface, "One small step for man, one giant step for mankind." But preparation for that historic day had begun many years earlier. In fact, school science textbooks described in detail how the first moon landing would be made a decade before the event. Ten years passed before the understanding of what to do became reality.

The time which elapses between understanding **how** to make technological developments and making them a reality is probably what prompted Paul Harvey to say, "Progress at its most accelerated rate is agonizingly slow." We must not lose sight of the potential benefit at stake when it takes a long time to move an idea from conception to reality.

As early as the mid-sixties, the Utah State Legislature established the Little Hoover Commission to determine how the emerging computer technology could assist government and education. The Commission pointed to applications in the private sector that could be adopted in governmental agencies and school systems to manage information in order to make government and education more productive.

The Little Hoover Commission findings precipitated the growth from four pilot schools from a single application of technology to over thirty-five districts using a broad range of computerized data-management applications. The primarily mainframe-oriented environment of the past two decades has taught us much about the capabilities and usefulness of computers. Educators have become convinced that the capacity of computers to manage data is integral to education and vital to its future potentialities.

The key to successful implementation of technology into the education process is visionary leadership. This leadership will need to address not only computer use for today but the possibilities of computer use for tomorrow and include many other forms of technology and their applications. It will need to think in terms not only of what <u>is</u> possible but also of what <u>might</u> be possible.

Some current issues which dictated the need for the study included:

A. Local autonomy versus the need and desirability to share, communicate, and cooperate.

B. Diminishing resources to support a growing student population.

C. Equity as it relates to district size and/or geographic location.

D. Multiple and often-incompatible systems solutions:

   1. Non-compatible data bases.

   2. Non-compatible communication protocols.

   3. Non-compatible application languages.

E. Acceptance of technology as a productivity tool in the classroom.

F. Decisions about what educators with vision want technology to do.

Study Introduction

On May 22, 1987, James R. Moss, State Superintendent of Public Instruction, commissioned a study of the uses of educational technology to be conducted by the State Office of Education in cooperation with IBM Corporation (see Appendix A). In that letter, Superintendent Moss states, "One of the major educational reforms we hope to accomplish in the state of Utah in the next several years is better utilization of technology in both our instructional and administrative areas."

Mission Statement and Objectives

Mission Statement

The purpose of this study is to develop recommendations for enhancing the quality, equity, and efficiency of the Utah education system through the use of technology.

Objectives

Objective #1:

Design state-of-the art technological models to be offered by the state to local districts.

Objective #2:

Expand and improve the "cooperative" information education technology network.

Objective #3:

Develop a plan to integrate the use of technology for instruction and management, thereby improving the quality and cost-effectiveness of education.

Objective #4:

Identify levels of technology awareness and training needed and develop a plan to meet the current and future training needs.

Objective #5:

Analyze current and projected services provided through technology in order to develop a procedure to establish priorities for new and existing projects.

Objective #6:

Identify financial and organizational requirements for implementing specified technological services and the benefits of these services.

The study team was chosen to include a significantly diverse cross-section of educational leaders, business administrators, building administrators, and classroom teachers. Additionally, IBM provided the services of an Application Transfer Study (ATS) specialist and local technical and marketing support.

"If education and technology are to be mutually beneficial in a lasting way, each must be willing to accommodate the other. Technology must become more user-friendly, but educators have to become more computer-friendly as well."

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Section II: General Findings

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General Findings

The intent of the study was to examine the past, present, and future uses of technology and how the implementation of these tools could greatly assist the educational process. The findings of the report have been measured against purposes for the study. The overall criteria have been as follows:

Can the use of technology

- greatly improve the quality of the education that is provided to the students of the public schools of Utah?
- significantly reduce the costs that presently exist in a very labor-intensive process or at least minimize the cost spiral that is projected for funding of education during the next two to three decades?
- provide equity or access to instructional programs, and in the quality of these programs, particularly in the rural areas of the state?

It is within this framework that the findings of the committee are reported. The data are sound and express a fair view of the needs, resources, current level, and direction of the use of technology in Utah's public schools. Educators told us what they need and/or want. We believe the road to an excellent education is paved with technology.

Included in **General Findings** are statements which are documented in depth in the sections following.

Several overriding issues provided impetus to the study and focus to the findings. They include the following technology-related areas:

A. Providing inservice.
B. Master planning.
C. Administrative services networking.
D. Distributive processing options available to local districts.
E. Classroom implementation of technology to assist teachers.
F. Reforming and restructuring of the instructional process.
G. Long-range connectivity/integration of the home, classroom, school, district, and State Office of Education.
H. Strategic plan.
I. Solution models.
J. Benefits.
K. Future applications.

Inservice

The most significant finding relates to the need for inservice at all levels of educators throughout the state. It is evident that there is a high degree of frustration among people when they are not properly trained to use the tools that are available to them.

The result of a lack of inservice is a lack of insight as to how tools might be used more effectively to improve the quality or productivity of the educational process.

The need for additional inservice and enhanced preservice instruction is the major factor in how well technology is being used or can be used in education; therefore, an inservice model is included in this report in Section V which clearly defines the appropriate inservice needs by level of administrators, counselors, teachers, and secretaries.

Master Plan

Clearly, the need for implementation master plans at the state, district, and local sites, is evident in order to make the best use of technology in education. The present lack of master plans has resulted in many different directions being adopted by local school districts, incompatible hardware and software implementations, and has made more difficult the challenge of hardware interconnectivity that will be so important in order to properly use the technology in the future.

The development of a master implementation plan under the leadership of the USOE and local school districts needs to be a high priority and should be completed prior to the legislative session of January, 1989.

System-wide master plans, compatible with one another, for educational technology should be developed and include consideration of the following components: needs assessment, efficiency, effectiveness, equity, compatibility, application, maintenance, networking, training, research, diversity, etc.

Present Services

The present administrative services offered by the Utah State Office of Education, in cooperation with the local school districts, are deemed to be adequate to excellent. Many school districts indicate that without these services, it would be impossible for them to provide the same level or type of services within their own districts.

Some school districts, by philosophy, have chosen not to become involved in the implementation of hardware and software within their own districts because of the requirement for developmental and/or maintenance staff, as well as the need for a substantial level of technical expertise. Therefore, they have, by and large, contracted with the State Office of Education to provide all or

some of those services. However, the services presently offered need to be enhanced, improved, and, in some instances, made much more flexible.

The data communications network (Utah Network of Educational Systems - UNES) must be upgraded to improve response time and overall stability. Certain components within the network must be upgraded to improve the "up time" and overall network capacity presently available. These components seem to be very sensitive in certain environments and cause a great deal of user frustration as they often fail or are so cumbersome that users eventually "give up."

The present application systems need additional flexibility. Uploading and downloading must be implemented in a practical manner, and additional distributive-processing options (see "Distributive Processing") need to be made available to various districts. A guiding principle which was defined within the study was that the applications should be available at the most cost-effective and practical level possible.

The operation of the Utah Network of Educational Systems (UNES) was deemed very important within the findings of the study. There is a need, however, to improve data base access and gateways into national data base facilities.

Lastly, current negotiations between the USOE and the State of Utah Division of Data Processing to share network facilities which will provide additional opportunities to improve the network, facilitate growth, reduce redundant network capabilities, and ultimately reduce overall costs should be aggressively pursued.

Distributive Processing

With the significant advancements in hardware and software the past decade, many of the applications which are presently available in the centralized host environment operated by the USOE might appropriately and even more cost-effectively be operated at a distributive level. Various levels of implementation based upon size of the district, the costs that accrue, and the district's philosophy need to be defined.

Network compatibility is essential and all distributive systems should have access to the statewide educational network (UNES) in order to continue to minimize the costs of software development and to promote continued cooperation. Standardized software should be available at all levels of hardware implementation.

Local Area Networks are becoming increasingly more flexible and easy to use and are extremely useful in both administrative and instructional support areas; therefore, Local Area Networks should be considered in any technology implementation plan and utilized where they can provide cost-effective and efficient support.

Office-support systems should be implemented which provide for word processing, document transfer, spreadsheet capability, and local data base manipulation.

Classroom Implementation

It is in the area of classroom implementation that there is the greatest need for inservice training, and this is one reason that this area has the least amount of usage. There are many ways by which teachers can use technology to assist them in their responsibilities within the classroom. The administrative functions of the classroom can be greatly assisted by implementing a classroom-management system for curriculum management, student performance, and attendance.

Technology must be implemented on a much broader scale to assist in these functions and relieve teachers of the many clerical functions that hinder their ability to be effective in their role of teaching.

Additionally, an item test bank, media resource bank, and an instructional objective bank are needed to facilitate the teaching process within the classroom.

The technology can perform other functions beyond those that are deemed as administrative. With the use of course-specific software, low-order skill instruction can be accomplished. Drill and practice activities, simulations and modeling, tutorial instruction, remediation exercises, and problem-solving opportunities can greatly assist the teacher in providing educational experiences for the students in the classroom. Math, writing labs, and science simulation are also core areas of promise in computerized teaching.

Local Area Networks (LAN)--in the classroom which have access to the overall educational network(s)--can support the implementation of school and classroom bulletin boards wherein teachers can communicate with parents and others regarding a vast area of important information and data bases. LANS will permit teachers to monitor student progress and provide instruction to small groups or clusters of students and will support the access of data bases at the classroom, school, district, state, and national levels.

More long term in nature is the need to establish and implement Local-Area-Network capabilities which have interconnect facilities at all levels and which directly support the instructional and information needs of administrators, teachers, counselors, students, and parents.

Restructuring of the Instructional Process by Using Technology

The findings of the study regarding the restructuring of the education process by using technology are not conclusive. This is a most sensitive subject and one that incites a high level of emotion among both proponents and opponents.

Restructuring options include using the technology to permit and provide the capability for teachers to teach more students. This option is still not well understood, nor is the process by which this function can be most appropriately implemented clearly defined. It is evident that technology can perform certain functions and provide certain capabilities that could relieve teachers of many tasks presently encumbering their time and energy.

For example, there is a growing number of studies that document that educational television, when implemented properly, produces acceptable instruction in the classroom; and when the number of students taught in this manner exceeds 60 or more, then the economies of scale begin to reduce the cost per student.

It is also known that certain other technological implementations in the classroom can not only greatly enhance the quality of the learning process, but can do it more economically than the present labor-intensive system. Math drill and practice, certain chemistry dry-lab environments (simulated laboratories), writing and reading skills, spelling, foreign languages (DALP), and science are but a few of the ever-expanding, cost-effective functions that can be performed by computer technology.

There is no question that computer simulation and modeling capabilities far exceed the ability of the teacher to provide similar functions or opportunities in the classroom without them. For example, major airlines use flight simulators, now with enhanced computer-generated graphics, to train their pilots in almost every conceivable emergency procedure.

Today in the classroom, teachers, using these technological capabilities, can simulate for students the massive problems of operating a city government wherein numerous variables can be manipulated and outcomes generated, or of running a business that requires skill and expertise that can be learned as students make simulated decisions, respond to simulated crisis situations, and perform other functions that directly impact outcomes. They can learn that the decisions which they make must be based on the best information available and that the manipulation of variables is much more than an intuitive process.

Finally, it is clearly evident that the only way that education will become more cost-efficient is by increasing the pupil/teacher ratio. Several models are presently being used in the state to accomplish this. Most include scheduling options such as year-round school or extended-day plans. There are others which now must be carefully evaluated to determine if they, too, can produce similar cost savings without jeopardizing students.

Technology applications which can be clearly demonstrated to either save money while producing the same level of quality measured in student performance or which increase the quality of the product at the same cost must be investigated and implemented as rapidly as possible and practical.

In summary, the implications of this finding are significant and include more students per teacher, expanded uses of technology to provide instructional experiences, reduced student/teacher contact in the traditional group or classroom setting, enhanced opportunity and improved facility for personalizing individual educational opportunities, extended use of distance-learning applications; e.g., Distance Accelerated Learning Project (DALP), telelearning using autographics, duplex video and simplex systems.

Long-Range Connectivity and Network Access

As the restructuring of education evolves as discussed in the previous section, the need for network connectivity will dramatically increase. In an environment where the traditional levels and methods of teacher contact and curriculum presentation are substantially reduced or changed, technology must provide the following:

- Greater student access to instructional opportunities and experiences from home, learning centers, and the classroom.
- Increased capability at the teacher level to preassess student readiness, prescribe learning experiences which most appropriately "fit" the individual student's "learning style," and assess or monitor student progress.
- Improved on-line access by parents and students via "electronic bulletin board" and "mail" systems. These systems would permit parents to acquire timely and relevant information regarding general school activities; specific classroom information and/or student assignments; daily, weekly, and term performance data; and teacher/parent/student communications and responses.

The finding of the committee is that these increased communications facilities will be critical if the instructional process is to become more efficient and cost-effective.

Additional findings and outcomes of the study which are significant are briefly stated as follows:

Strategic Plan

The major activities of the strategic plan are a direct result of the analysis of the problems, recommendations, and benefits contained in this report. The plan (see Section V, Strategic Plan) includes phased time lines and provides a broad framework to develop a detailed educational technology master plan.

Solution Models

An attempt has been made to identify appropriate implementation models which would yield significant benefits throughout the public education system of the state. These models have been defined in two major categories (e.g., administrative and instructional). Several options have been included within each category based upon needs and district philosophy.

The administrative models have been based upon the present service model offered by the USOE to the school districts with a growth path to include various levels of distributive-processing options. These options provide a broad-based continuum of hardware/software implementations which encourage districts to make informed and appropriate choices regarding the level of hardware/software which is most cost-effective and efficient.

The instructional models include implementation strategies and considerations which permit and encourage teachers to use technology as a "tool" to assist in the instructional process. If any major "restructuring" of this vital process is to occur, it will be as a result of the appropriate implementation of technology in the classroom. This process change will be extremely painful, but the benefits which may accrue could be enormous.

The models specify (in general terms) the hardware/software which will be required to facilitate the introduction of productive, cost-effective processes within the instructional process.

Benefits

Several significant benefits have been documented as a result of the study. The most significant benefit defined was a substantial improvement in the opportunity for teachers to provide more effective student instruction. Additionally, it has been concluded that using technology would result in more efficient use of staff time.

These and other benefits defined in the study would improve the quality of the instructional process and could substantially reduce overall costs, either through direct cost reductions or redirected effort which effects overall efficiency.

Future Applications

Many future applications of the technology are addressed in the study report. They include facilities to allow for greater information access, improving the present cooperative network, and developing new technologies. Improved curriculum offerings which would be supported by new and advanced technology tools, and which would continue to improve the productivity and cost-effectiveness of education in the state, were also highlighted as important future applications.

"Because of technology, many educators have been able to respond more quickly to change in their own schools ... and to provide timely reports and projections that enhance the credibility of district superintendents."

Section III: Current Environment

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Current Environment

Problems

In this section, the statements regarding the problems, recommendations, and benefits that were defined by the educators who were interviewed and surveyed by the team members are documented. The 11 problems of most concern include the following:

Problem Statement #1: Inservice Training and Support

Adequate inservice training for the use of technologies is lacking at every level throughout the state.

- Many lack basic knowledge of available services and technologies for educational and administrative tasks.
- Many users of technology have not been adequately trained in the capacities and uses of these systems.
- User groups lack ongoing specific inservice training which corresponds to their particular use of equipment and level of responsibility.
- Students are frequently more interested in and knowledgeable about computers than staff members.
- The present inservice structure does not provide adequate time or funding.
- Administrators lack time to be adequately informed about technology.
- Administrators have not been adequately trained in the availability and use of technology.

Problem Statement #2: Instructional Applications

Many Utah schools lack adequate access to, and sufficient application of, technology for instruction at all levels of responsibility.

- Sufficient and compatible hardware resources are inadequate to assist fully with educational tasks (e.g., instructional, managerial, and administrative).
- Educators lack flexible, compatible, user-friendly software to benefit instructional and informational processes.
- The State Office does not provide validated software evaluations.
- Educators are not fully using state-of-the-art technologies (e.g., computers, microwave, satellite, and laser disk systems) to assist instruction at all levels and in all subjects.

- Educators are not able to fully implement technologies to manage instruction on a consistent and equitable basis.
- Instructional systems are not adequately networked.
- Educators lack access to or do not use educational data bases.
- Inadequate and costly site preparation hampers the installation and use of technology.

Problem Statement #3: Interactive Networking

The present data communications network does not have the capacity necessary to support the interactive applications presently available.

- Various network components are often "down" and thereby preclude access to the system.
- The present transmission rates are not adequate to transmit data (especially full screens) at a speed necessary to provide an acceptable level of response time.
- The use of converters for system compatibility has resulted in serious "downtime" problems in some locations.
- Network traffic during certain hours is excessive and substantially decreases response time.
- Present upload and download options are not implemented on a broad scale; and some capabilities are not available so as to permit desired access, transfer, and manipulation of data at local levels.
- Adequate staff is not available to address all network-management problems.

Problem Statement #4: Master Planning

Utah public education lacks a system-wide master plan for guiding the uses of technology in schools.

- Technology is often purchased without adequate regard to other functions (e.g., compatibility, use, software, maintenance, networking, training).
- Planning for efficiency, effectiveness, and equity using technology is limited.
- Limited research has been done to determine educational needs and uses.

- The lack of a statewide plan hinders the state's ability to provide adequate support to technological diversity.

Problem Statement #5: Electronic Mail/Communications

The mail system (electronic mail) is not universally viewed as a productive tool and is not utilized consistently throughout the state.

- All administrators do not use mail, so incoming messages are not received in a timely fashion.
- Users perceive mail as cumbersome and functionally weak.
- Mail coverage is limited because not all districts participate in the cooperative network.
- Mail lacks word processing capability.
- Access to mail is difficult.
- Users are not adequately trained on mail functions.

Problem Statement #6: Student Information

The Student Information System (SIS) does not offer some functions, the lack of which preclude the most effective use of the information available.

- Daily attendance data is not currently available within SIS.
- The class scheduler is archaic and lacks the flexibility to support trimesters and year-round options.
- SIS does not support the unique needs of the area vocational centers (e.g., open entry, open exit).
- The interface requirements between SIS and various classroom-management models have not been defined.
- The requirements of SCRAM (the Special Education subsystem of SIS) are too restrictive, especially to the non-SIS districts.
- Inadequate report card options do not allow school-by-school processing (e.g., each district must be processed as a whole).

Problem Statement #7: Hardware/Software Compatibility

The substantial amount of non-compatible hardware and software throughout the school systems of the state limits potential interaction and exchange of data.

- Guidelines regarding the purchase of computer hardware and software at the school district and state office levels do not exist.
- Vendors often sell solutions which are not validated or consistent with any of the network strategies.
- Multiple data formats and definitions preclude the sharing, aggregation, or correlation of data.
- Software is not readily transferable from one type of hardware to another.
- Interfaces which permit communication between non-compatible devices are expensive and limit capability.
- Incompatible hardware impedes accessibility to information.

Problem Statement #8: Fiscal Limitations

Limitations in the present fiscal system prevent some districts from utilizing the available functions offered by the state.

- The system lacks flexibility (e.g., account-number dimension, report generation, multiple fiscal year budgets).
- The present system limits forecasting and modeling capacity (e.g., salary, budget, negotiations, student-enrollment projections).
- The fixed-asset system is cumbersome, generates unnecessary reports, and is not designed for use in the public schools.
- Presently, the state does not provide direction regarding the update or replacement of existing remote-job-entry support hardware.
- The existing remote-job-entry hardware is expensive to maintain.
- The on-line fiscal data-entry process is too slow for high-volume input.
- The districts lack a school food service accounting package with flexibility, capacity, and response time to meet the needs of any public school.
- Local schools lack an accounting package that includes revenue accounting that interfaces with the district accounting system.

Problem Statement #9: Documentation Concerns

Documentation of current hardware and software is often too technical or unclear, leaving the user confused.

- User manuals are often incomplete, unclear, or outdated.
- Most programs lack on-line help screens and support.
- Directions for the use of mail (electronic mail) are unclear.
- SIS and statewide fiscal programs need timely, updated documentation.
- Applications like word processing often lack appropriate documentation for user support.

Problem Statement #10: Funding Inadequacies

Adequate funds are not available for technology.

- Site preparation and furniture add to the cost of using technology.
- Hardware maintenance costs are significant and are often not considered in overall cost projections.
- Sufficient funds are not available to provide adequate inservice programs at all levels.
- Software costs are excessive (e.g., purchase, maintenance, upgrading, licensing for multiple copies).
- Cost-effective studies are lacking regarding the use of technology in education.
- Not enough funds are allocated for the purchase of hardware.

Problem Statement #11: Integration/Cooperation

Adequate interface is lacking among the various technological systems (e.g., cooperative networks, district independent systems, national data bases, legislative data base, other agencies).

- The transfer of student records from an independent district system to an SIS user or vice versa cannot be done electronically.
- Mail cannot be transmitted to or from independent systems.
- The Special Education SCRAM system is difficult to use by independent system users.

- Concern exists that the desired flexibility and autonomy of those districts which have independent systems would be lost or compromised by becoming part of the cooperative statewide system.

- Disagreement exists regarding the benefits of cooperative networks.

- It is difficult to recognize differences regarding various systems. Users are reluctant to integrate.

These problem statements represent the vast majority of problems that were discussed during the interviews and/or extracted from the survey sheets. The following chart (**Chart #1**) includes the list of problems and graphically depicts the number of times the problem was mentioned (top line) and the number of groups in which the problem was discussed (bottom line).

"Students who are able to learn computer programming tend to become clearer thinkers, more logical reasoners, and better problem solvers as a result ... these are valuable skills for life as well as for school."

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PROBLEMS

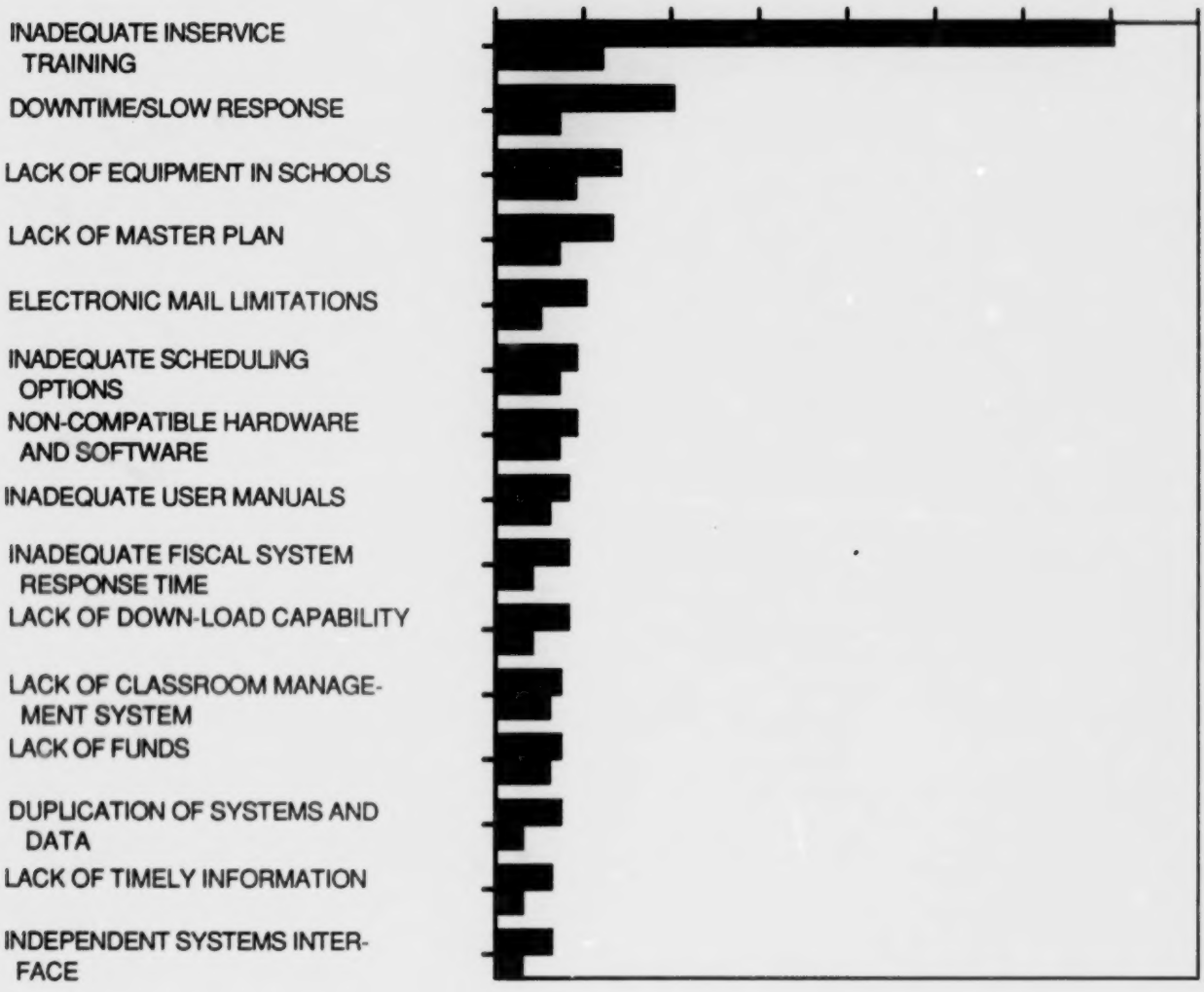

CHART I

It is evident from this chart that the most significant problem identified during the interviews was that of inadequate inservice training (70 occurrences). This problem has over three times the number of occurrences as does the next most commonly mentioned problem which was down time or slow response of the present computer system or network (20 occurrences).

The lack of equipment in schools was mentioned 14 times, followed by the lack of a master plan with 13 occurrences and electronic mail limitations with 10 occurrences.

Chart #2

PROBLEMS	# OF GROUPS	# OF OCCURRENCES
INADEQUATE INSERVICE TRAINING	12	70
DOWN TIME/SLOW RESPONSE	7	20
LACK OF EQUIPMENT IN SCHOOLS	9	14
LACK OF MASTER PLAN(S)	7	13
ELECTRONIC MAIL INSTRUCTIONS	5	10
INADEQUATE SCHEDULING OPTIONS	7	9
NON-COMPATIBLE HARDWARE AND SOFTWARE	7	9
INADEQUATE USER MANUALS	6	8
INADEQUATE FISCAL SYSTEM RESPONSE TIME & ENHANCEMENT	4	8
LACK OF DOWNLOAD CAPABILITY	4	8
LACK OF CLASSROOM-MANAGEMENT SYSTEM	6	7
LACK OF FUNDS	6	7
DUPLICATION OF SYSTEMS/DATA	3	7
LACK OF TIMELY INFORMATION	3	6
INDEPENDENT SYSTEMS INTERFACE	3	6
LACK OF DAILY ATTENDANCE SYSTEM	3	5
INADEQUATE FIXED-ASSET SYSTEM	3	5
LACK OF HARDWARE MAINTENANCE	4	4
LACK OF HARDWARE	3	4

"Software producers tend to give education what it is comfortable with and will pay for ... up to now, educators have been far more comfortable with electronic workbooks for drill purposes than with programs that shape critical thinking."

Recommendations

As the interviews were conducted, each interviewee was asked to identify one or more recommendations which would assist in resolving the problems which had been discussed during the first portion of the interview.

The recommendations were compiled and analyzed by the team which then used the data to generate recommendation statements which attempt to specify solutions that, if implemented, would provide significant impetus to the appropriate uses of technology in education.

The recommendations that were identified by the interviewees and by the team include the following:

Recommendation #1: Inservice, Training, and Support

The USOE should develop a Technology Assistance Center to plan and implement information sources, models, inservice, and training in technology.

- A sequence for inservice should be developed and implemented for various user groups (e.g., needs assessment, awareness, training, application, evaluation, and revision).

- Guidelines unique to technology training should be developed and used considering the following: peer teaching, simplicity, accessibility to training, follow-up on-site application and support, one-on-one instruction rather than group instruction for those with unique training needs and/or high computer anxiety, training only when application on hardware and software is accessible.

- Criteria and priorities for training of staff should be established (e.g., consideration should be given to the need of administrators to model for teachers and teachers to model for students).

- Alternative training modes, technological problem-solving methods, and maintenance-support techniques should be developed and enhanced (e.g., hot line, transmission system for distance/learning, teleconferencing or teletraining, self-study training, video instruction, media software support).

- User manuals and media/computer software should be carefully screened and, if necessary, redesigned for simplicity (e.g., user-friendly prompts, ready-reference cards, keyboard instruction templates, on-line help screens).

- Awareness of, and training in, programs with a high use of technology should be provided initially by the Technology Assistance Center. (As they proliferate, those responsibilities should be increasingly deferred to related state office specialists. Examples of such programs include Wandah Writing Labs, Mastery Math,

computer-assisted drafting, Writing to Read, teacher certification, and SCRAM.)

- The Technology Assistance Center should maintain information on, examples of, and training in state-of-the-art technology and technology-assisted programs.

- The Technology Assistance Center should provide validated software evaluations and courseware.

- Due to the large variety of systems and the limited support available, state-provided training and support should be focused upon compatible systems which will be identified. The list of supported systems should be updated on a regular basis.

- Alternative staff resources for providing development, inservice, and other support should be pursued (e.g., teaching fellowships on assignment to state or district(s), state-level teachers on special assignments, funding of substitutes, interns, teacher time contributed by districts in development partnerships, university student/staff development partnerships, released time, industry).

- Strategies and training for implementing the computer studies curriculum should continue to be developed for teachers.

- Serious consideration should be given to various methods of accelerating the available use of technology by educators (e.g., legislative computer-purchase subsidies for teachers, local school purchase incentives, instructional-management software, connections and furniture for computers, computer technology teacher endorsement--optional, required computers for new staff, stipends, advancements, leadership position).

- Inservice should be structured in a variety of ways (e.g., short and intensive or ongoing).

- Inservice should include job, program, equipment, and discipline-specific options.

Recommendation #2: Instructional Networks

To realize the full potential of computing technological support for instruction, networks should be established to exchange information and transmit instruction.

- To facilitate cooperative development and sharing of instructional resources to support Core Curriculum strategies, a statewide data base with the ability to upload and download information should be implemented.

- Instructional courseware should be available from a host system so that software can be shared with school labs or classrooms for initial, corrective, or enhanced instruction.

- An assessment-item data base linked to specific instructional objectives should be provided to enable teachers to monitor student progress toward mastery of course requirements.

- Access to national and university data bases should be provided so that information is available for decision making, classroom instruction, and student research.

- Networks should be developed to provide programs to homebound students and adult learners, information via electronic bulletin boards, some student progress information, and support for other alternative delivery systems such as video.

- A school-facilities design should be developed which addresses the physical requirements of technology in new-school construction.

- Local plans should provide for upgrading of existing facilities to address technology needs.

- To facilitate statewide instructional delivery, compatible technological equipment should be utilized within and among districts and within and among service-center regions. These systems should be compatible with large networks already in existence (e.g., EDNET, SETOC, etc.)

Recommendation #3: Instructional Quality and Productivity

Utah schools should utilize technology to enhance the quality and productivity of instruction.

- Given present emphasis on productivity and restructuring of instruction, advanced technologies should be carefully researched and developed for their benefits (e.g., computer-assisted instruction, day labs, master teacher(s) instructing several classrooms using interactive video, computer management of various scheduling innovations, drill-and-practice/remediation).

- Instructional delivery should be enhanced by utilizing technological options (e.g., computer, software, video, interactive video, microwave and satellite systems).

- Sufficient technology should be offered to personalize instruction (e.g., tutorials, problem-solving, word processing, software checkout for at-home use).

- Instructional-management technologies should be provided to teachers at all levels and in all subjects (e.g., diagnosis, prescriptions, test-item banks).

- Flexible management of student information should be provided at the classroom level (e.g., attendance data, behavior files, gradebook reports, interest inventories, learning styles, preschool data).

- Technology should be provided to assist in the planning of instruction and scheduling of assignments, media, evaluations, resource people, and activities.

- Technology should be used to disseminate student and course information to various audiences (e.g., to districts, to various departments, to teachers, to parents, and to students).

- Innovation and replication of technological programs should be encouraged for instructional delivery and management.

- Basic computer/technological literacy should be taught at every level throughout the state (e.g., keyboarding, word processing, simple system operation, and ethics).

Recommendation #4: Administrative Network

The Utah Network of Educational Systems should be enhanced to allow data bases to be distributed to all districts and schools and to improve the present service levels.

- Applications should migrate to the appropriate level where the greatest degree of cost-effectiveness and overall efficiency will accrue. Cooperative planning and piloting should define the guidelines for implementation.

- Multiple options of service and equipment combinations should be offered which consider district size and needs, levels of expertise, hardware and software availability, desired applications, required data-base access, report-creation needs, data manipulation and spreadsheet interfaces.

- The upload and download capacity, which could operate in an unattended mode, should be enhanced and include the ability to select data elements/records from the data base.

- The centralized support for software development and maintenance should be continued so as to provide the opportunity for districts to cooperate and share in applications that would not be available or would be too costly if implemented on an independent basis.

- The present technical capabilities of the network should be improved to include more reliable digital circuits and higher communication line speeds.

Recommendation #5: Administrative Software Enhancements and New Development

Administrative services should be enhanced to resolve present weaknesses, provide additional functions and applications, and increase flexibility of use.

- The Student Information System should be upgraded to provide the ability to review transcripts without printing (e.g., transcripts should be available for review with or without printing update histories).

- Software for scheduling classes should be upgraded to accommodate flexible scheduling (e.g., trimester, year-round, extended-day) and to permit on-site scheduling.

- A daily/hourly attendance package should be provided to the local districts.

- The fiscal system should be enhanced to provide additional capability (e.g., a more flexible account number and reporting structure, salary and budget forecasting, improved fixed-asset system, on-site printing, multiple-year budgets, in-school sales, department fees).

- The mail system (electronic mail) should be upgraded to include additional functions (e.g., automatic word wraparound, page forward and backward, word processing interface, easier access, improved user manuals).

- A standardized school food service and transportation application should be adopted and made available to the schools of the state.

- Administrative support for the area vocational centers should be made to include such functions as support of open-entry/open-exit attendance policies, tracking of student competencies, and work placement and performance data.

Recommendation #6: Funding

Through a cooperative effort of the Legislature, USOE, and local districts, funding should be <u>appropriated</u> for the support of technology.

- The Legislature should provide appropriate funding for the development and implementation of technology in state school systems.

- All state and local education agencies should determine a reallocation of funds to provide support for the development, procurement, and utilization of technology (e.g., training, hardware, software, maintenance, building preparation).

- Appropriate levels of funds for technology acquisition should be allowed from developmental grants (e.g., productivity, outcome-based education).

- Districts should be allowed to write proposals for grants to replicate validated technology projects that coordinate with the state master plan.

- Districts should be encouraged to write proposals for grants to develop new applications of technology which are coordinated with the state educational master plan.

- Various partnerships should be organized to help provide funding to support technology systems in schools (e.g., local districts, community groups, business partnerships, foundations, and universities).

- Creative incentives should be provided to schools for in-class technologies.

- Financial incentives should be offered to teachers for the purchase of school-compatible computers.

Recommendation #7: Cost-Effectiveness

The USOE and the school districts should do very careful cost-effectiveness/productivity studies of the uses of technology in education.

- The costs of administrative and instructional services provided to school districts as a function of the cooperative statewide effort should be determined and validated.

- The costs of administrative and instructional services provided by local districts independent of the cooperative effort should be determined and validated.

- The costs of similar administrative and instructional services provided in other states should be acquired for comparative purposes.

- The criteria required for accurate cost comparisons between various service options should be determined, compared, and documented.

- The processes for providing administrative and instructional services should be defined.

- The Teacher Assistance Center should periodically determine and validate the cost-effectiveness of new and existing technologies in classroom instruction, management, and networking.

- New administrative and instructional technologies should be developed, procured, and evaluated as to their cost-effectiveness and productivity (e.g., new transmission services, interactive video, equipment for the handicapped).

- The most cost-effective processes for providing administrative and instructional services should be defined and implemented.

The recommendations are extensive in nature and imply a substantial and long-term commitment to the uses of technology in support of education. Clearly, it is imperative that these recommendations be analyzed with great care to identify their value, cost-effectiveness, and wherein they might improve productivity within the educational environment.

The benefits of these sections are discussed in the subsection entitled "Benefits--Potential and Actual."

Chart #4 includes the graphic data regarding the number of occurrences and the number of groups in which each recommendation was mentioned.

Again, the recommendations focused on providing increased inservice. Increased inservice training was recommended by 36 interviewees in 14 different groups. It is evident that there is a substantial need for a greater degree of inservice training regarding the uses of technology in all aspects of education.

Increased technology in the classroom was discussed by 20 individuals in 10 groups and indicates the desire to implement technology in the classroom. The recommendation highlights the need to provide additional technology within the classroom itself, so that it might be used by the teachers and students to improve and enhance educational opportunities.

Increased technical support was discussed by 18 interviewees in 10 groups and is indicative of the need for hardware/software support, especially related to problems that occur in using the technology (e.g., writing programs, formatting diskettes, network communications, etc.).

The fourth recommendation discusses the need to have standardized hardware and software so that the problems of incompatibility are minimized and the advantages of transportability maximized.

In summary, seven major recommendations were defined from the recommendations identified during the interviews and extracted from the survey documents. The strategic plan for implementation of these recommendations is found in Section V, "Strategic Plan," and includes basic time lines whereby the recommendations will be implemented.

Chart #3

RECOMMENDATIONS & INTERVIEWS	# OF GROUPS	# OF OCCURRENCES
INADEQUATE INSERVICE TRAINING	14	36
INCREASED TECHNOLOGY IN THE CLASSROOM	10	20
INCREASED TECHNICAL SUPPORT	10	18
STANDARDIZED HARDWARE/SOFTWARE	9	12
TIMELY, ACCURATE INFORMATION	3	8
STUDENT INFORMATION SYSTEM IMPROVEMENTS	6	7
ELECTRONIC MAIL IMPROVEMENTS	5	6
MASTER PLAN FOR TECHNOLOGY	4	6
NETWORKING & COMMUNICATIONS IMPROVEMENTS	5	5
UPLOADING & DOWNLOADING CAPABILITIES	4	5
DECENTRALIZING DATA PROCESSING	3	5
STATEWIDE DATA BASE WITH GATEWAYS TO NATIONAL DATA BASES	3	4
PERSONNEL SYSTEM ENHANCEMENTS	2	4
AUTOMATED DATA ENTRY	3	3
RESTRUCTURE INSTR. SYSTEM TO INCORPORATE TECHNOLOGY	3	3

"Computers offer a wide open door, an almost infinite means to access rich, truly educational experiences limited only by the vision of those who deliver the instruction and the imagination of their students."

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RECOMMENDATIONS

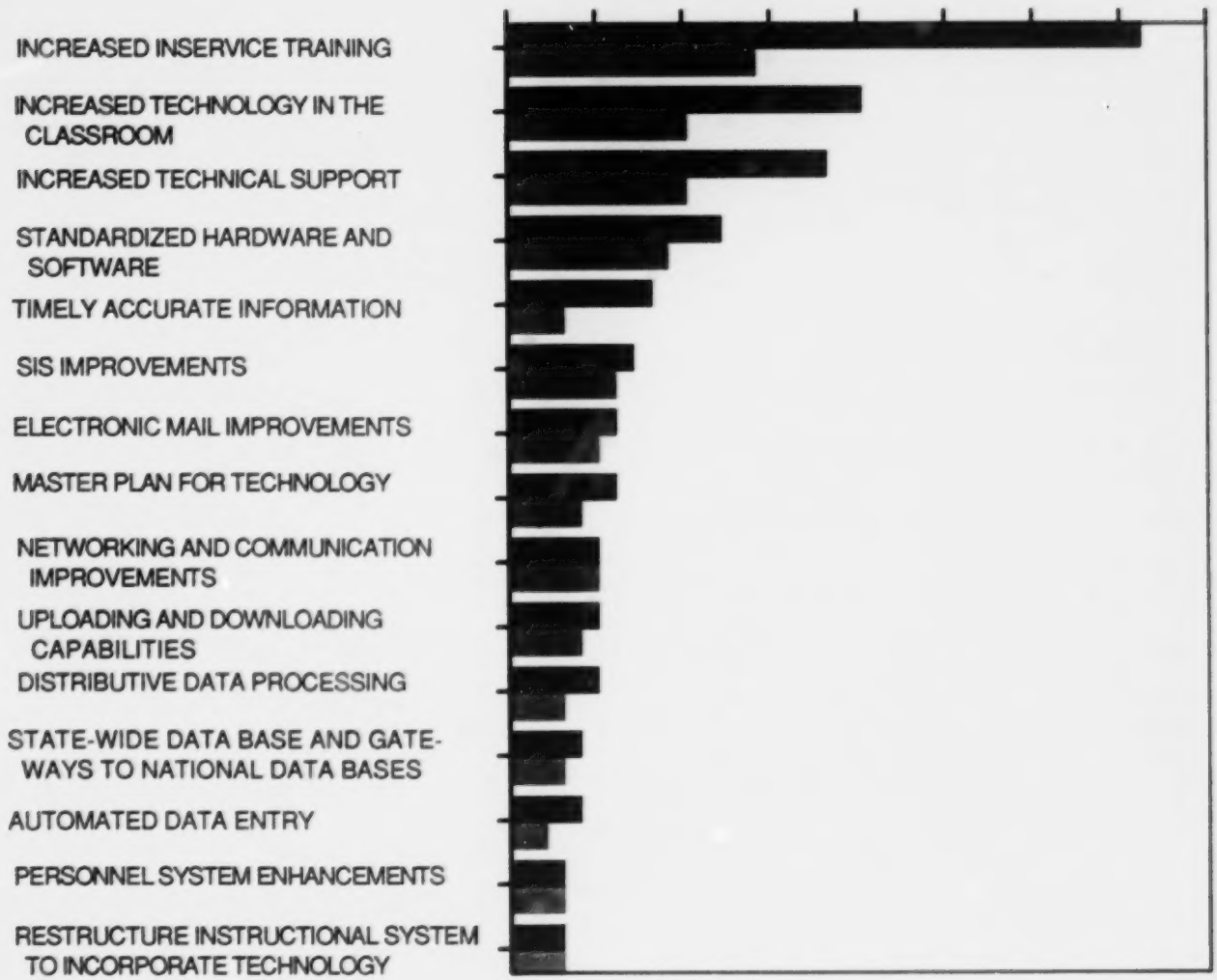

CHART 4

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Benefits–Potential and Actual

During the interviews, interviewees were asked to identify what benefits they saw from the implementation of technology to support and/or provide educational experiences for students. It should be noted that these benefits are often stated in terms that are not easily validated and where actual cost-savings may not be easily defined. More often than not, the benefit statements implied a significant increase in quality as well as productivity. No attempt was made to generate benefit statements as was done in the problems and recommendations areas; however, Chart #6 shows the specific detail of the benefits as defined by the interviewees and survey respondents.

The most significant benefit as defined in this process was more effective student instruction. It is obvious that this is, by and large, a qualitative gain, although it is very possible that productivity gains could be realized as students move more rapidly through the curriculum and/or require less teacher time than is true within the traditional educational mode.

The second productivity gain or benefit was that of a more efficient staff. If staff is to be more efficient, they will be able to accomplish more within the same time period. This is obviously a productivity gain but must be tempered with the fact that teachers often spend a great deal of their "own" time to grade papers, prepare tests, prepare lesson plans, etc. It is, therefore, conceivable that greater teacher efficiency may simply mean that they will spend less of their own time on school-related tasks.

An attempt has been made to quantify the benefits identified in this process. It should be noted again that these resultant values have not been validated and cannot be directly applied against budgets or FTE allocations; however, they do provide a picture of the perceived productivity increases and/or dollar savings which will accrue as a function of the utilization of technology in the educational process. These benefit estimates are found in the section on "Solution Models and Costs" (Section IV, Chart #17).

"Students consistently report that they enjoy computers because they can move at their own learning pace and make mistakes with less fear of embarrassment in front of their peers ... the computer lets them be in control."

Chart #5

BENEFITS Potential and Actual	# OF GROUPS	# OF OCCURRENCES
MORE EFFECTIVE STUDENT INSTRUCTION	10	30
MORE EFFICIENT STAFF	12	17
IMPROVED QUALITY/ACCURACY OF INFORMATION	8	17
MONEY SAVINGS	9	16
HIGHER STUDENT ACHIEVEMENT	9	16
IMPROVED PRODUCTIVITY	9	12
TIME SAVINGS	8	9
BETTER SELF-IMAGE	4	6
REDUCED STRESS	6	6
REDUCED DUPLICATION OF INFORMATION	5	5
REDUCED USE OF PAPER	4	4
IMPROVED EMPLOYEE MORALE	3	3

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BENEFITS (POTENTIAL AND ACTUAL)

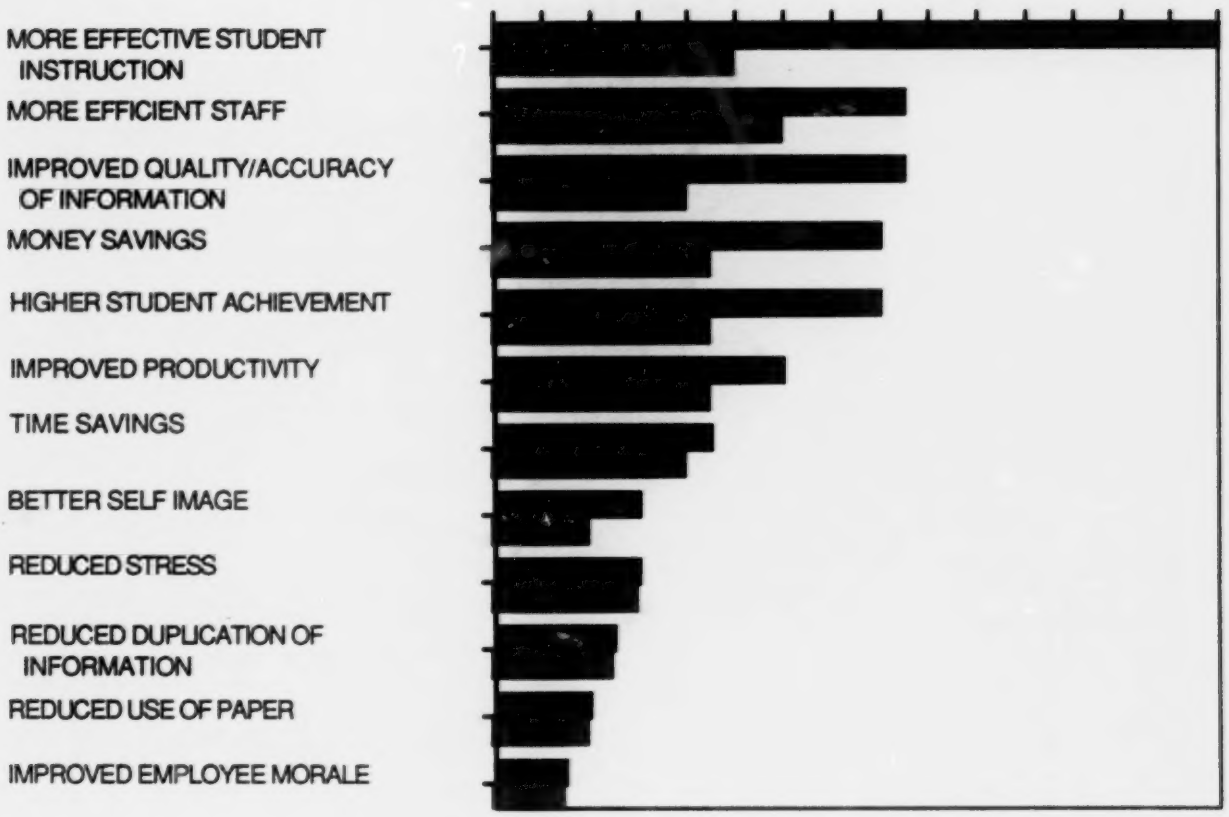

CHART 6

Future Applications

During the interviews, questions regarding future applications were asked so as to identify those areas that, although not presently being utilized, would be the most desirable to consider in any kind of long-range plan. **Chart #8** graphically provides the data concerning responses both as to occurrences and number of groups.

The most-often-requested future application was greater information access, specifically so as to allow access to various information and/or data bases both at the state and national levels. Commonly mentioned data bases included software evaluations, courseware, bulletin boards, media libraries, university libraries, teacher certification, inservice activities, workshops and conferences, and electronic mail.

Other items of high priority were an improved cooperative network (UNES) wherein response time and overall network availability would be enhanced.

A significant desire for increased inservice training was also evident and is a common thread running through the issues discussed by the interviewees.

Many interviewees recognize that there will be a continuum of new technologies that might be applied and used within education. Their fourth "future application" request was to develop and utilize these new technologies.

Other items that were considered and mentioned included improved curriculum that could be supported by technological tools within the classroom, increased availability of hardware and software, equitable distribution of technologies, and an increased level of technologically assisted instructional packages.

Chart #7

FUTURE APPLICATIONS	# OF GROUPS	# OF OCCURRENCES
GREATER INFORMATION ACCESS	12	35
IMPROVED COOPERATIVE NETWORK	12	25
INCREASED INSERVICE TRAINING	6	15
DEVELOP & UTILIZE NEW TECHNOLOGIES	8	12
IMPROVED CURRICULUM	9	12
INCREASED AVAILABILITY OF HARDWARE/SOFTWARE	5	12
EQUITABLE DISTRIBUTION OF TECHNOLOGIES	9	11
INCREASED TECHNOLOGICALLY ASSISTED INSTRUCTION	7	10
BROADENED CLIENT SERVICES	7	10
EVALUATED SOFTWARE RECOMMENDATIONS	5	6
INCLUDE TIME TO USE TECHNOLOGY FOR TRAINING AND DEVELOPMENT	5	5
CONVERSION TO "PAPERLESS SYSTEMS"	4	5
ADEQUATE FUNDING TO IMPLEMENT TECHNOLOGY	3	5
INCREASED TECHNOLOGICAL SUPPORT	4	4

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FUTURE APPLICATIONS

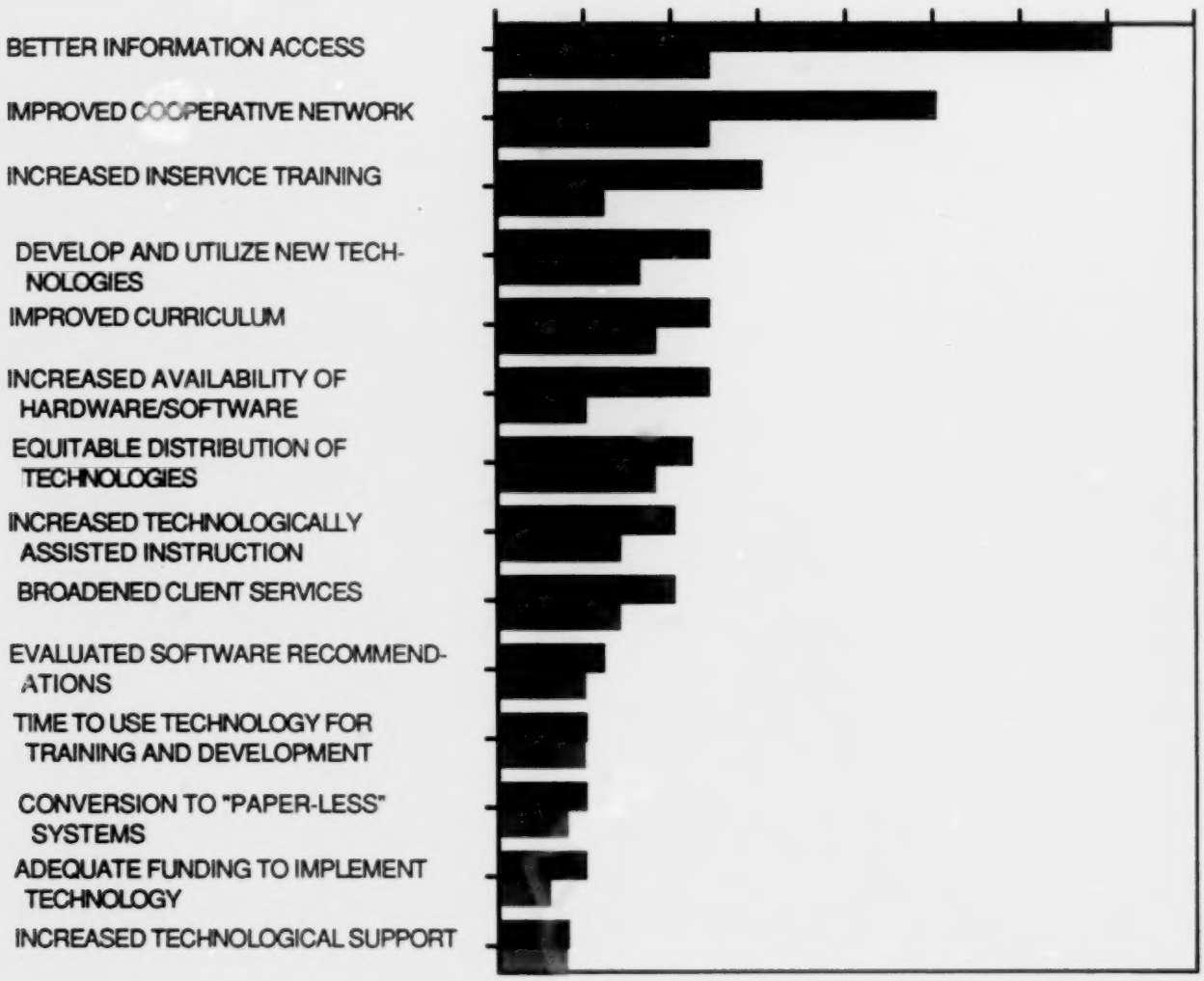

CHART 8

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Priorities

Priorities were addressed in the interviews so as to establish a possible schema by which the problems and recommendations could be systematically addressed. **Chart #10** provides the specific number of occurrences and number of groups in which each priority was discussed.

Inservice training is the most prominent priority, followed by standardization and compatibility of hardware and software, the need for a master plan, implementation models, technical support, and the enhancement of the present application systems offered to the school districts.

These identified priorities were used with the recommendations discussed earlier to define the specific strategic-planning activities that are defined in Section V, "Strategic Plan."

Chart #9

FUTURE PRIORITIES	# OF GROUPS	# OF OCCURRENCES
TRAINING ON HARDWARE/SOFTWARE	10	14
STANDARDIZATION AND COMPATIBILITY	10	14
MASTER PLAN AND IMPLEMENTATION MODEL	7	12
TECHNICAL SUPPORT	7	7
SIS* IMPROVED/CUSTOMIZED	5	6
SCHEDULE/ATTENDANCE IMPROVEMENTS	3	4
DISTRIBUTIVE PROCESSING	2	3
TIMELY INFORMATION AND EASY ACCESS	3	3
ELECTRONIC MAIL ENHANCEMENTS	3	3

*STUDENT INFORMATION SYSTEM

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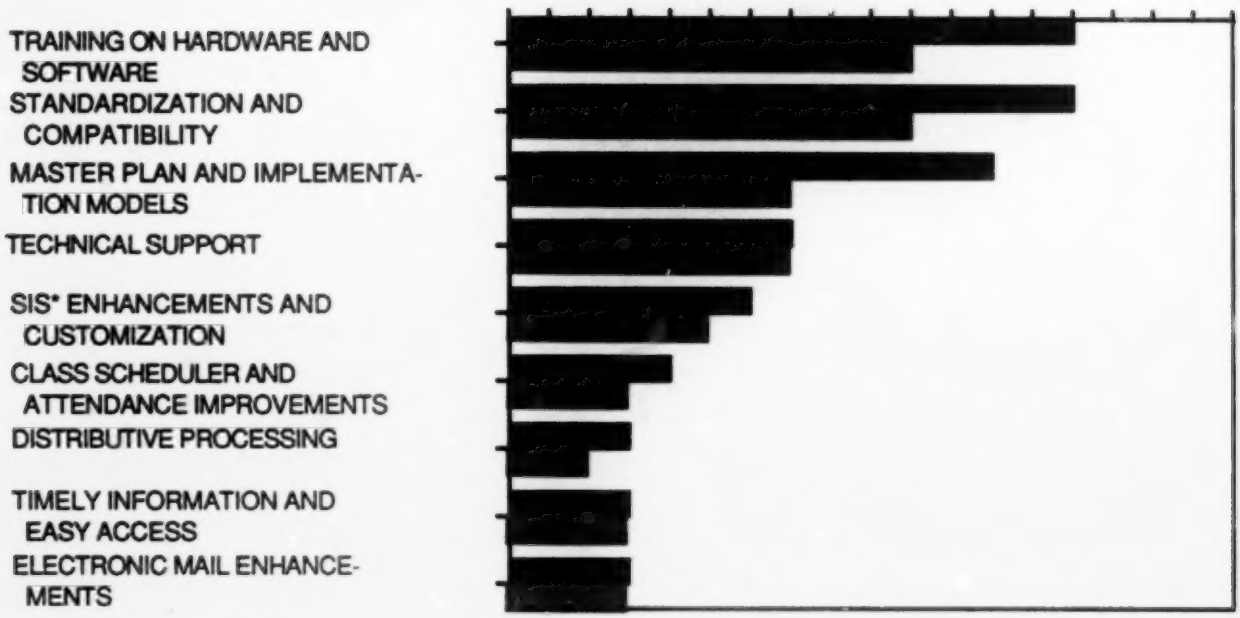
PRIORITIES



* STUDENT INFORMATION SYSTEM

CHART 10

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Section IV:
Solution Models and Costs

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Solution Models and Costs

In this section, an attempt has been made to identify the most appropriate solution models that, if implemented, would yield significant benefits throughout the public education system of the state of Utah. The purpose of these definitions is to provide guidelines and directions to those who are responsible to plan, manage, and implement practices and processes which will improve the public school system.

The study has provided a significant amount of invaluable information that has been used by the team as the foundation for these suggested models.

Administrative Models

It is evident that a great deal is already known about the value of using technology to assist in the administrative and management functions of the school, district, and state office levels. Either overall costs have been greatly reduced or substantial cost-avoidance benefits have accrued.

The administrative solution models are, therefore, a result of that which has already been demonstrated and proven as providing significant, overall benefits. They include various options and levels and are phased over time.

The options include and provide for a significant range of choice while still maintaining the most important ingredients that are needed to accrue the greatest level of cost savings and maximum benefits when measured in productive and qualitative terms.

The administrative models are founded upon the long-term cooperative effort of the school districts and the State Office of Education to enhance cost-effective administrative services with the various school districts so as to allow the capability of the computer to be available regardless of size or geographic location. As hardware has continued to evolve in capability and the cost/capability ratio has continued to improve, distributive processing solutions have become more and more practical.

Therefore, the administrative models proposed in this study include a range of flexible choices which can be implemented based upon a district's needs and desires. The choices range from an on-line interactive environment to the use of multi-user processors at district and school sites.

It is relevant to note that many of the smaller or even medium-sized districts may choose to continue in the on-line interactive environment. This environment allows them the capability to access the host-site mainframe computer, utilize the standardized software and data base facilities available, minimize the technical support staff required at the district site, and minimize hardware and software costs, as well as maintenance costs and problems. This environment is also appropriate for the large districts which might select this option.

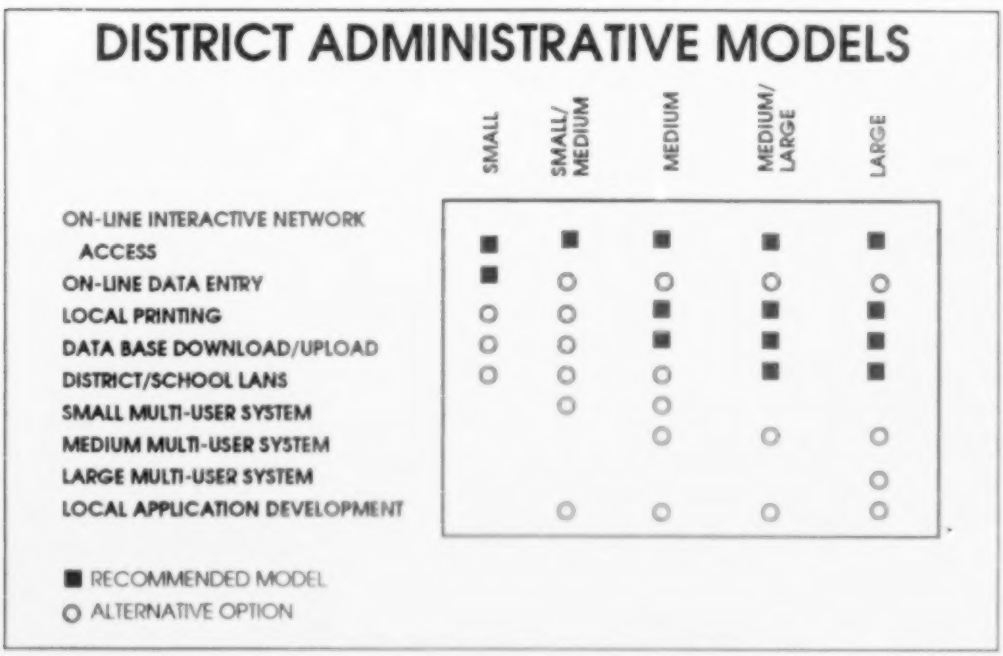
District-Level Administrative Models

Chart #11 (Administrative Models) defines the type of hardware/software environments from which districts may appropriately choose. The types and sizes of hardware/software implementation models are listed down the side, and the sizes of the districts are grouped along the top. The chart indicates the recommended models by district size, as well as alternative choices based upon size and district philosophy. As noted on the chart, it is recommended that all districts take advantage of the on-line interactive network access. This network will permit the access to the many information data bases available at the State Office of Education (e.g., Core Curriculum, microcomputer software evaluations, public-domain or licensed software files, electronic mail capability, proposed legislative language (future), Utah Code, textbook adoptions, inservice training offerings, exemplary project descriptions, teacher certification data, and many others). Additionally, all other student service functions and fiscal applications would also be available via the host mainframe.

The other options defined include an array of progressively more sophisticated distributive system configurations, each successive model adding more functionality at the local site. Again, it should be noted that as on-site functionality increases, so does the need for on-site technical support.

The chart implies the appropriate installation over time of Local Area Network (LAN) facilities and multi-user systems. Although an in-depth discussion of these two facilities will not be attempted in this document, it is appropriate that they be considered, especially in the long term, as viable and practical options to meet the needs of local school districts. They have also been used in determining the appropriate costs of the various models.

Chart #11



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The major and driving philosophy of what models to implement at the district administration level should include the following:

1. Applications should be run at the most cost-effective level that is practical.

2. District philosophy should be clear regarding levels of technical expertise desired at the district level and the level of hardware/software appropriate.

3. Concerns regarding or desirability of cooperation versus local autonomy.

Building-Level Administrative Models

There are certain administrative functions required at the building level. They might include some or all of those items contained in the left column of **Chart #12** (Building-Level Administrative Functions). The number and choice of which applications that would be appropriate for an individual building is again dependent on the philosophical approach (e.g., how much a school desires to run on site, what level of sophistication of on-site application is desired, and what expertise exists to support these on-site applications) and on cost considerations.

Chart #12 **BUILDING LEVEL ADMINISTRATIVE FUNCTIONS**	
1. SCHEDULING 2. ATTENDANCE 3. SUB-SET OF STUDENT INFORMATION (DOWNLOAD) 4. SUB-SET OF PERSONAL SERVICES 5. FOOD SERVICE APPLICATION (BON APPETITE) 6. CLASSROOM LAN 7. SCHOOL LAN (UP TO 3) 8. BULLETIN BOARDS 9. FISCAL MANAGEMENT	**BUILDING SIZE** I. SINGLE TOKEN RINGS: up to 260 Devices 100 Sessions II. TWO TOKEN RINGS: up to 520 Devices 200 Sessions III. THREE TOKEN RINGS: up to 780 Devices 300 Sessions

In the right column of the chart--Building Sizing--networking facilities (Local Area Network--LAN) within buildings are defined. It is felt that the token-ring architecture would most appropriately facilitate the needs of the various user entities within a single building. Token-Ring architecture allows multiple devices to be attached together using file and print servers. It permits individual workstations to access the network itself, and allows communication with other users within the network and access to software packages available to the network. As is noted, the number of token rings required is dependent upon the number of devices which are to be attached and the number of concurrent sessions which are operational at any moment in time.

When more than one token ring is required within a school, it is possible to link each network facility together. The number of devices which need to be linked is again dependent upon the needs and philosophical approach of the school/district administration. This information is provided to demonstrate the feasibility of establishing such local area networks at the building level.

Chart #13 (Administrative Models, Software Functions) describes the basic set of administrative functions and capabilities at the district and school levels. It also includes a breakdown by size of district, type and size of school, and the recommended (denoted by "X") or optional (denoted by *) applications/capabilities at each level. Also noted are recommended time lines (e.g., Phase I - 1 to 3 years, Phase II - 3 to 5 years, and Phase III - 5+ years). These time lines are only suggested and are for information purposes only. Since each district and/or school is already at a different stage of development, these time lines are given so that extrapolated projections might be made using the present status as a base and desired level of implementation as the time line determinant.

ADMINISTRATIVE MODELS
Software/Functions

	Attendance	Class Scheduling	Word Processing	Financial Management System	Download/Upload Files	Student Information System	Electronic Mail and Calendaring	Food Services	Local Area Network	Instructional Management System	Bulletin Board	Media Center
DISTRICT												
Large		*	■	■	■	■	■	■	■	■	■	
Medium		*	■	■	■	■	■	■	■	■	■	
Small		*	■	■	■	■	*	■	■	■	■	
SECONDARY SCHOOL												
Large	■	■	■	■	■	■	■	■	■	■	■	
*Medium	■	■	■	*	■	■	*	■	■	■	■	
Small												
ELEMENTARY												
*Medium	■		■	*	■	■	■	■	■	■	■	
*Small	■		■	*	*	■	*	*	■	*		
PHASES	1	1	1	1	1	(1-2)	2	2	2	2	(2-3)	

*INCLUDES INSTRUCTIONAL MODELS

Instructional Models

The most significant impact to and benefit for education in the state will occur at the instructional level. As has been mentioned earlier in this document, the issues of increased productivity and improved instructional quality can only be addressed by the implementation of technology to be used by teachers as a tool to assist in the instructional process. If the present technologies can be implemented in that process with the same degree of success that they have been in other facets of human endeavor, then the benefits in terms of increased productivity and improved quality will be enormous.

If the same kind of revolution and restructuring that has taken place elsewhere as a result of technology is to occur within education, there will be a significant level of evolutionary stress. Change is difficult at best. Rapid change can seem unbearable, and the accelerated rate of change that is clearly needed in education might become impossible to envision.

Without a completely defined and carefully executed inservice plan, the desired functions and enormous benefits will never accrue to the instructional process. This plan is discussed later in this section.

In the definition of an instructional model for the uses of technology in education, many assumptions were made. A list of some of these assumptions is found in **Chart #14**, "Assumptions for Instructional Models." These assumptions define the model as it will look after five or more years and may take as many as ten years to fully implement. It is recognized that during these time frames, the technologies available will continue to advance and probably will not "look like" anything which is presently available; however, these models are included for information purposes and provide a statement of direction as well as proposed implementation data.

Additionally, it is projected that the costs associated with the technology will continue to decline at the same rate as they have over the past ten years. This rate of decline has equaled 10 percent per year. This fact is very significant and must be utilized as a factor in the overall cost projections. One tempering fact which will reduce the net impact of this overall rate of decline in costs is that as costs go down, the desire and affordability of additional or enhanced capability rises. For the purposes of this study, the rate of 10 percent per year has been used to extrapolate long-term costs of projected implementation models (see Chart #17).

Chart #14

ASSUMPTIONS FOR INSTRUCTIONAL MODELS

Each classroom will have Local Area Network (LAN).

Courseware and software downloaded from statewide network.

Micro lab in each school (36 in large/15 in small).

One-to-six (micro) printer ratio to micros in lab.

One micro per five students.

Homebound communication for instruction.

Home access to selected student information.

Each classroom and media center access to external data bases.

Each classroom interaction with statewide network.

Each classroom will have computer-managed video/audio disk system.

Each classroom : large-screen projector.

District learning to supplement instructor needs (e.g., microwave, satellite).

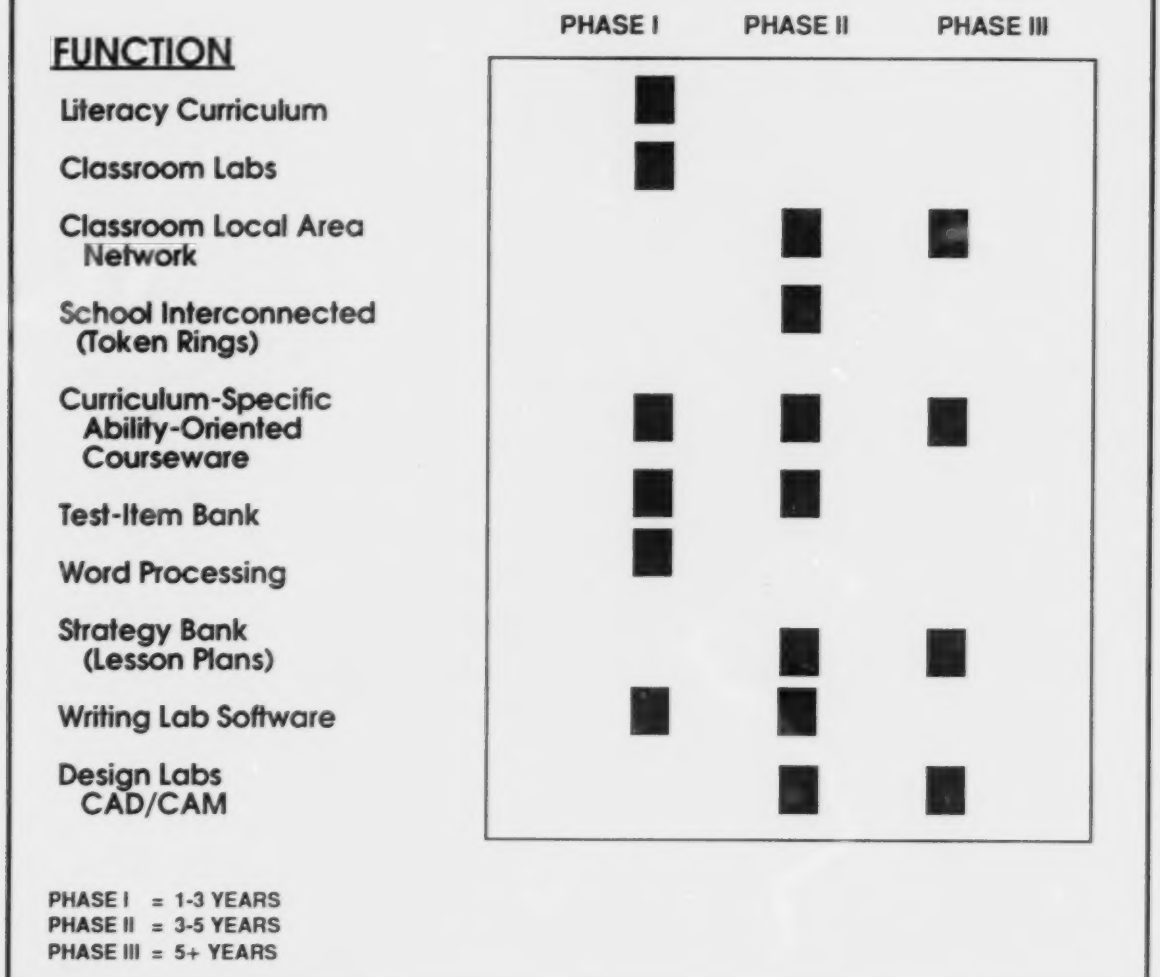
Teacher uses:

- Instruction (CAI)
- Managing Curriculum
- Grading/Gradebook Management
- Student Tracking (achievement)
- Item-Test-Bank Access
- Media Resource Bank
- Instructional Objective Bank

Chart #15 (Instruction Models - Function Implementation by Phase) describes in basic format the functions and the approximate phases during which each function might be implemented.

Chart #15

Instruction Models (Function Implementation by Phase)



Obviously, some functions may be accelerated or slowed within the projected time frame(s) as readiness and individual plans might dictate.

Chart #16 (Overall Administrative/Instructional Model) identifies the aggregate model of the various network hardware components which will be required to support the administrative and instructional functions. This model is intended to identify the Phase III (5+ years) configuration which will meet the overall needs of the various levels (e.g., USOE, district, school, classroom, and home) of the educational system.

The main components include:

1. System-wide network access.
2. Multi-user processor at the district level (where appropriate).
3. Multi-user processor at the school level (where appropriate).
4. Administrative local area network (LAN) (district, school).
5. Classroom LAN.
6. National network gateways (e.g., Source, Compuserve, Specialnet, Vocnet).
7. Computer-support lab.
8. Flexible configurations.
9. Time lines for phase-in implementation.

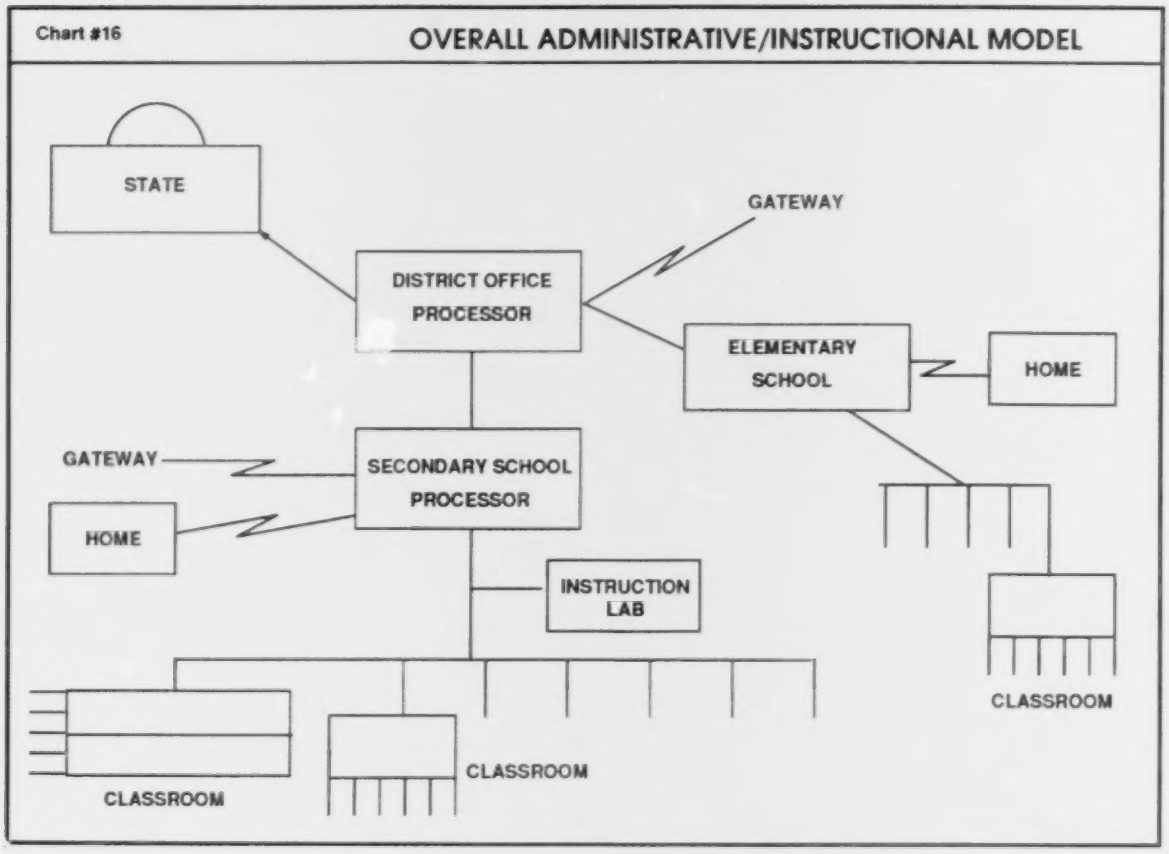


Chart #17 (Model Solutions) identifies the overall models and their resultant costs (based upon today's prices. During the past ten years, hardware/ software costs versus capability have declined an average of 10 percent per year. Clearly, this cost/performance ratio change will continue, if not accelerate, during the next ten years.). Also included are the benefits which will accrue as a result of the implementation and utilization of technology in the educational process. These benefits were identified by the interviewees and survey respondents and have been quantified and costed. These estimates are included so that the costs of the technology can be compared against the benefits.

Chart #17

MODEL SOLUTIONS (LARGE, MEDIUM, SMALL DISTRICT)

PHASE I - 1-3 YEARS

ADMINISTRATIVE FUNCTIONS/ACTIVITIES

- ATTENDANCE
- CLASS SCHEDULING
- STUDENT INFORMATION SYSTEM (SIS)
- WORD PROCESSING
- FINANCIAL MANAGEMENT SYSTEM
- DOWN/UPLOADING FILES

INSTRUCTIONAL FUNCTIONS/ACTIVITIES

- CLASSROOM LABS
- LITERACY CURRICULUM
- CURRICULUM-SPECIFIC, ABILITY-ORIENTED COURSEWARE
- WORD PROCESSING
- WRITING LAB SOFTWARE

DISTRICT	ESTIMATED COST	EXTRAPOLATED COSTS (10% REDUCTION)	(BENEFITS) ESTIMATED HOURS *
Large	$714,000	$642,600	19,935
Medium	444,000	400,000	43,704
Small	294,000	274,600	76,674

* Number of hours saved or redirected per year as calculated at end of the phase and is cumulative by phase.

MODEL SOLUTIONS (LARGE, MEDIUM, SMALL DISTRICT)

PHASE II - 3-5 YEARS

ADMINISTRATIVE FUNCTIONS/ACTIVITIES (+ LEVEL I)

- STUDENT INFORMATION SYSTEM (SIS)
- ELECTRONIC MAIL/CALENDARING
- FOOD SERVICE
- LOCAL AREA NETWORK
- INSTRUCTIONAL MANAGEMENT SYSTEM
- BULLETIN BOARD

INSTRUCTIONAL FUNCTION/ACTIVITIES (+ LEVEL I)

- CLASSROOM LOCAL AREA NETWORKS (LANS)
- TEST-ITEM BANK
- DESIGN LABS (CAD/CAM)

District	ESTIMATED COST	EXTRAPOLATED COSTS (AVERAGE 20%)	(BENEFITS) ESTIMATED HOURS *
Large	$ 853,000	$ 682,400	12,357
Medium	488,000	380,400	25,892
Small	236,000	188,800	58,846

MODEL SOLUTIONS (LARGE, MEDIUM, SMALL DISTRICT)

PHASE III - 5-10 YEARS

ADMINISTRATIVE FUNCTIONS/ACTIVITIES (+ LEVELS I & II)

- STUDENT INFORMATION SYSTEM (SIS)
- MEDIA CENTER
- BULLETIN BOARD

INSTRUCTIONAL FUNCTION/ACTIVITIES (+ LEVELS I & II)

- SCHOOLS INTERCONNECTED (TOKEN RINGS)
- STRATEGY BANK (LESSON PLANS)

DISTRICT	ESTIMATED COST	EXTRAPOLATED COSTS (AVERAGE 30%)	(BENEFITS) ESTIMATED HOURS *
Large	$1,188,000	$ 831,600	6,765
Medium	1,183,000	828,100	12,322
Small	501,000	350,700	24,162

*Number of hours saved or redirected per year as calculated at end of the phase and is cumulative by phase.

Inservice Model

Appropriate training is the key to effective technology utilization and was identified as the primary problem. As a result of this study, it is apparent that if the concerns over training could be solved, the use of technology would increase significantly.

The committee strongly felt that if the technology industry really wanted to increase sales, they would greatly enhance the training materials and options available to entry-level technology users.

Because of the limitations of business and preservice training, it falls upon the state and local districts to identify the needs and develop methods, materials, and options for training in innovative, as well as established ways.

We must carefully consider the variety of users to be trained, the breadth of content needed for those various users, the level of inservice needed, the alternatives for delivery available or needing to be developed, trainers, funding, and time for training. It is necessary that we focus on the needs of the consumer and adjust training to meet those needs, rather than only offering set courses as the only options to which users must conform, group by group. The variables among users, and fears of technology and displaying ignorance of areas to which they have not been adequately exposed, are unique in these areas of inservice and cannot all be accommodated in traditional ways.

The following suggestions for designing inservice for the specific needs of people, schools, etc., are to encourage thinking about inservice in unique ways. They should be carefully considered by districts and will be carefully considered at the state, as we prepare technical support in the areas of technology.

Staff Development Plan (Personal, Group,...)
For Date
Topic/Area
Level Required
To be completed by Inservice Coordinator
When
Location
Provider
Method
Funding/Credit
Other

Inservice Level

Staff Development

LEVEL I AWARENESS:

Generally, this level is designed to inform, motivate, and provide a general overview of a project, product, plan, etc. Usually, it provides information (input) but does not require performance based on that information. Such inservice is often one to four hours in duration.

LEVEL II TRAINING:

this level provides specific instruction and is intended to enable personnel to perform (output) a particular skill. As opposed to the learner gaining understanding, it is intended that the trainee reach an application level.

Training needs are at least at two levels:

Beginning: This person has little previous exposure beyond awareness; has limited need for the program, functions, skills; applies training, but tends to be a part-time user, etc.

Advanced: This person has had previous training, and/or possesses some skills. He/she is interested in further applications and tends to be a sophisticated, knowledgeable user.

LEVEL III MENTORING:

This level provides on-site adjustments, modeling, and support to an already trained person. It provides an opportunity for application-specific questions and answers through a specific resource person.

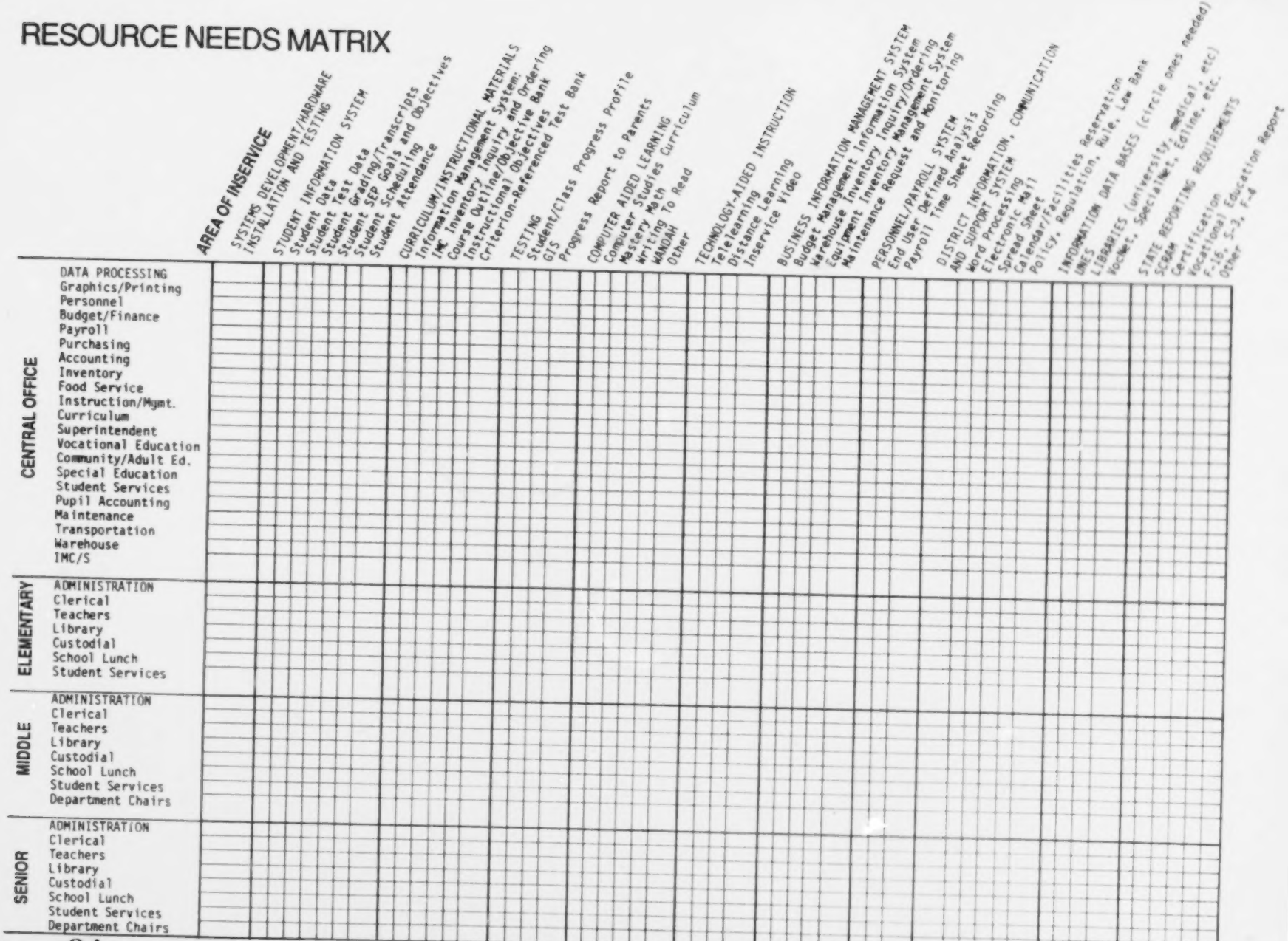
LEVEL IV MAINTENANCE:

This level allows opportunity for minor adjustments and provides reminders, prompts, newsletters, etc.

LEVEL V ENHANCEMENT:

This level provides opportunities for advanced users to brainstorm additional applications, identify expanded needs, etc.

RESOURCE NEEDS MATRIX



Inservice Providers

State Office of Education Staff

District Office Staff

Peers/Mentors

Consultants

Higher Education Staff

Industry/Vendors

Methods

Direct Instruction
- Individual
- Group
- Conferences
- Workshops
- Distance Learning

Technology
- Interactive Video
- Television
- Microwave/Satellite Links
- Telecommunications
- Computer

Other
- VCR Cassettes
- Slide Show Presentations
- Manuals
- Self-Instruction Software
- On-Line Tutorials

Guidelines

- Training should have immediate application. (In Mahopac, N.Y. Central School District the same computer each teacher uses during training becomes the first computer used in his/her classroom. There is little down time between training and application.)

- Follow-up visits to use sites are critical to promote application.

- Quality, appropriate, accessible inservice is more important than any other factor in insuring successful use of technology.

- Inservice should target administrators, staff, and parents to develop systemwide support.

- An inservice plan should recognize some educators' "fear" of technology. Some of the following could address this problem: peer instruction, one-on-one instruction, computer (infinitely patient) instruction, simplified instructions, etc.

- Training priorities should be set in each school and each district (as well as the state). Administrators and teachers should be trained and act as models for students-in-technology use.

- Instruction should be supported by simple materials, user prompts, ready-reference cards, keyboard templates, on-line help screens, etc.

- Inservice support for technology should be focused on certain systems, programs, etc., and be reevaluated on a regular basis.

- Incentives for teacher computer purchase should be carefully considered as a support to training.

- An inservice data base should be maintained for statewide access to training options.

- Incentives should be offered to encourage inservice in technology. Some suggestions include computer rebates to individuals and schools, career-ladder funding, optional technology endorsement, college and lane-change credit, and district contractual requirements.

Section V:
The Strategic Plan

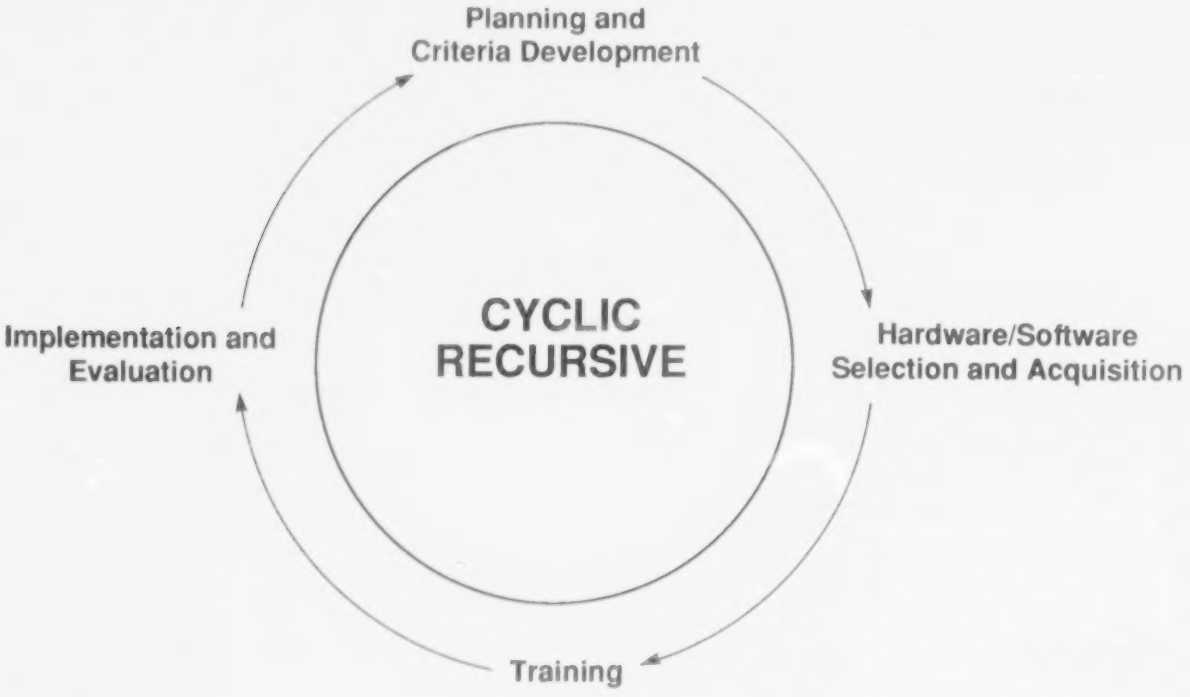
The Strategic Plan

The implementation plan for such a comprehensive study is extremely complicated and cannot be generated without many assumptions. It is obvious that districts are not in the same place in implementing and using technology in any of the areas addressed in the study. It should also be noted that not only is there wide divergence related to the status and use of technology in each district, there are also significant differences in philosophy and direction.

This section defines the overall strategic plan for the uses of technology in education. The major activities of the strategic plan are a direct result of the analysis of the problem, recommendations, and benefits derived from the surveys, interviews, and team conclusions. This strategic plan has been defined across a phased timeline which provides an appropriate perspective and introduces the practicalities of a realistic schedule.

The length and number of the phases are somewhat arbitrary but are included to provide a broad, general outline and framework to develop more careful and detailed sections of the Educational Technology Master Plan (see Master Plan Section or statement).

Additionally, it is imperative that planning be viewed as a process and not an event. Planning must be continuous and integrated with the other relevant steps of any implementation process. The following is a simple schematic or cycle that leads from planning to implementation and evaluation.



This schematic identifies at least four major phases to the process:

A. Planning and Criteria Development

B. Selection and Acquisition

C. Training

D. Implementation and Evaluation

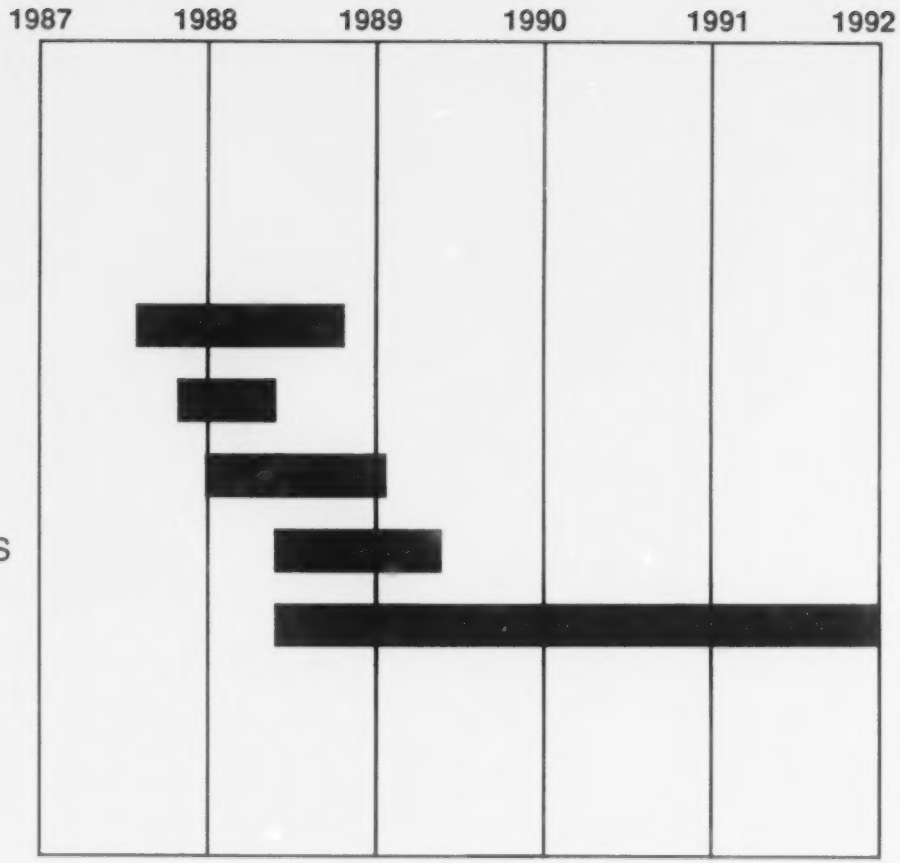
Although the schematic implies an end-to-end process, it is obvious that it is not sequential but has many overlapping characteristics. It is important to consider all of the major issues as implied by the schematic in preparing for and executing any implementation process.

The following pages provide a more specific delineation of the time lines associated with each recommendation as previously defined. These time lines are meant to be indicative and reflect the tasks and estimated amount of time required to complete each task. Additionally, they represent a philosophical approach that implies a positive and relatively aggressive posture related to the implementation of technology to improve education.

The first and foremost task will be to prepare a detailed master plan which would provide a substantially higher level of detail to those tasks than this report. The effort to prepare the first of a series of master-plan editions will provide a better perspective and will permit a more careful analysis of the tasks and time frames that are included in a "first-draft" format. However, it was felt to be essential to begin the task of building the overall master plan. The included time-line charts should be viewed as a "first cut" and should be used as indicative tasks and time lines that will be updated as the master plan is developed.

Strategic Plan: ETS (Page 1)

MASTER PLAN



Strategic Plan: ETS (Page 2)

INSERVICE TRAINING

ESTABLISH TECHNOLOGY SUPPORT CENTER

DEVELOP A SEQUENCE FOR INSERVICE (1.1)

ESTABLISH INSERVICE GUIDELINES (1.2)

DEFINE CRITERIA AND PRIORITIES (1.3)

DESIGN ALTERNATIVE MODELS (1.4)

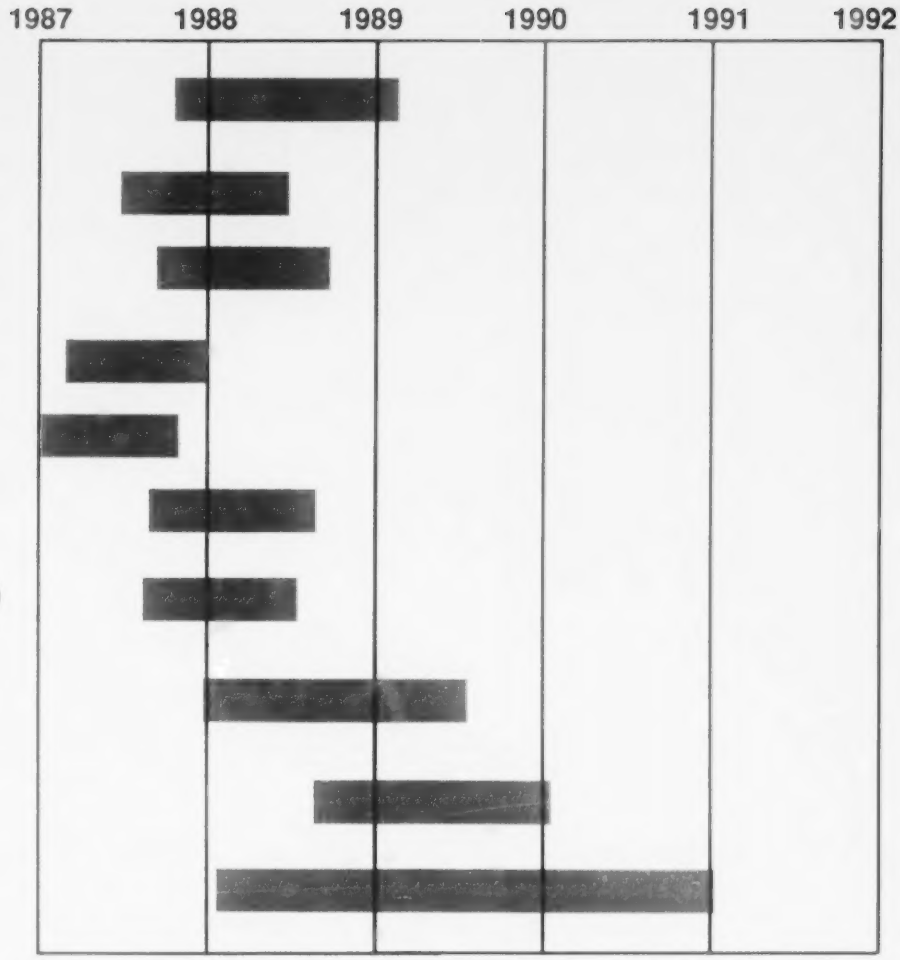
EVALUATE AND REDESIGN USER MANUALS (1.5)

IDENTIFY COMPATIBLE AND SUPPORTED SYSTEMS (1.9)

PURSUE ALTERNATIVE STAFF RESOURCES FOR PROVIDING DEVELOPMENT AND INSERVICE (1.10)

DEVELOP COMPUTER STUDIES CURRICULUM TRAINING STRATEGIES (1.11)

DEFINE METHODS TO ACCELERATE THE USE OF TECHNOLOGY BY EDUCATORS (1.12)



Strategic Plan: ETS (Page 3)

INSTRUCTIONAL NETWORKS

DEVELOP STATE-WIDE DATA BASE TO SUPPORT CORE CURRICULUM STRATEGIES (2.1)

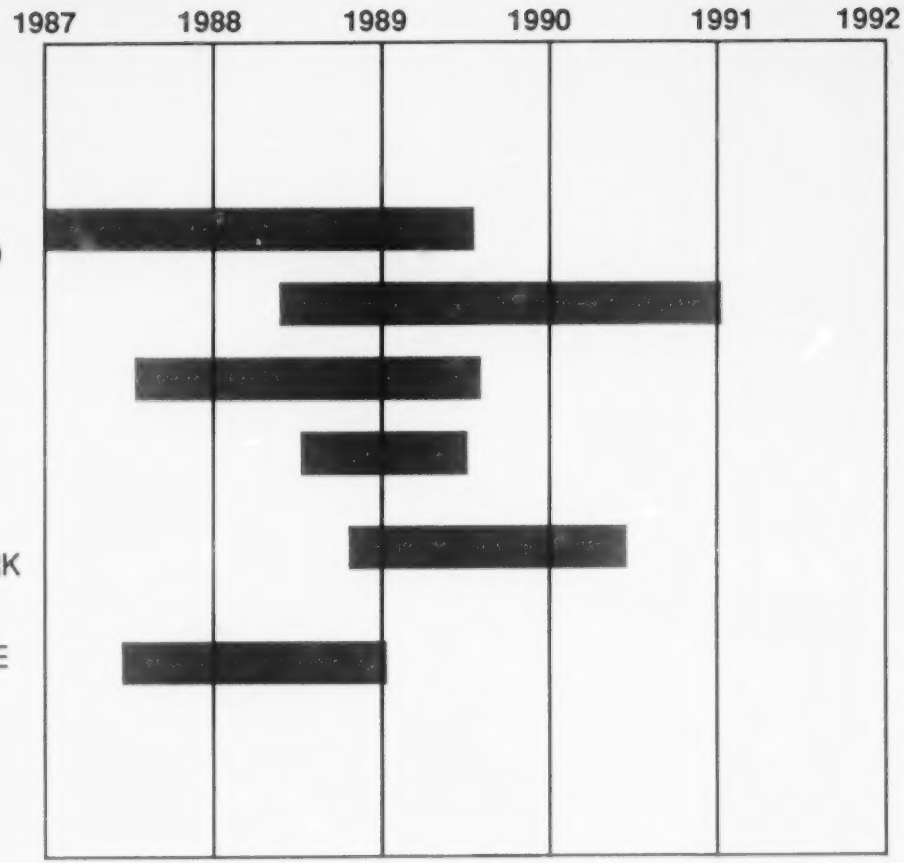
INITIATE AN INSTRUCTIONAL COURSEWARE DATA BASE (2.2)

BUILD AN ASSESSMENT ITEM DATA BASE (2.3)

PROVIDE FOR NATIONAL AND UNIVERSITY NETWORK ACCESS (2.4)

DEVELOP AN INSTRUCTIONAL SUPPORT NETWORK FACILITY (2.5)

DEFINE COMPATIBLE EQUIPMENT AND SOFTWARE STANDARDS AND GUIDELINES (2.8)



INSTRUCTIONAL QUALITY AND PRODUCTIVITY

RESEARCH ADVANCED TECHNOLOGIES WHICH EMPHASIZE PRODUCTIVITY AND RESTRUCTURING (3.1)

ENHANCE AND RESTRUCTURE THE INSTRUCTIONAL DELIVERY SYSTEM (3.2)

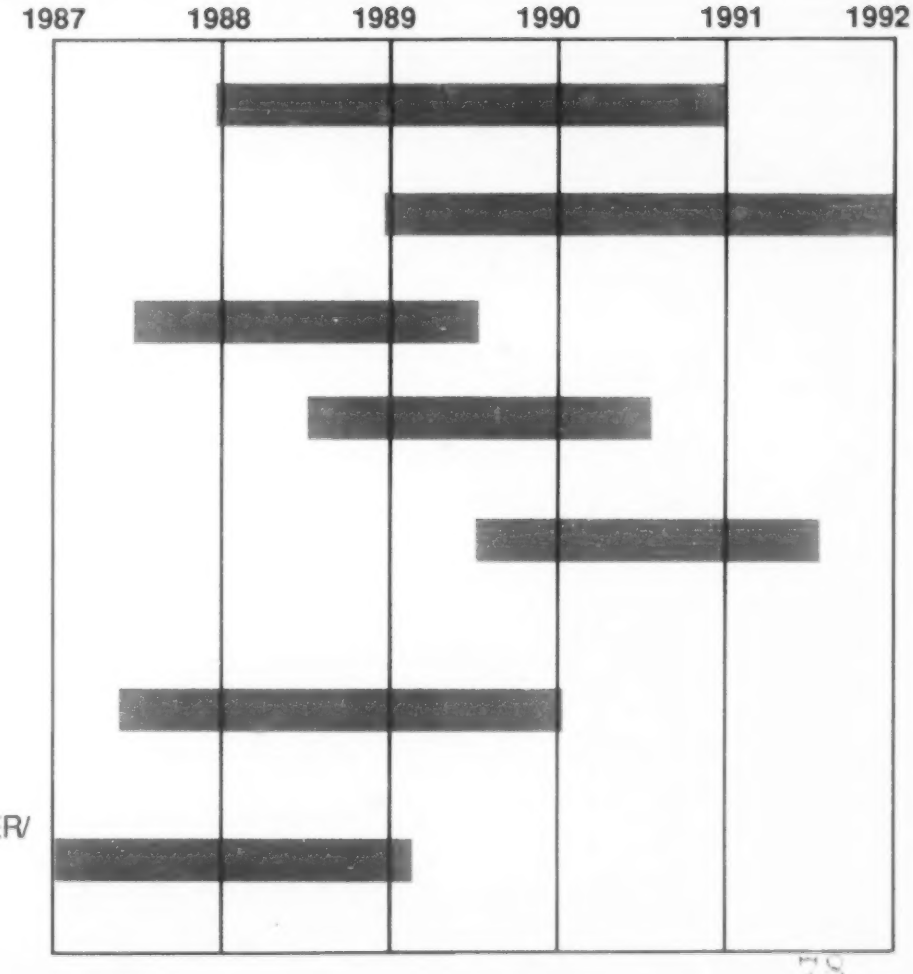
PROVIDE INSTRUCTIONAL-MANAGEMENT TECHNOLOGIES AND SYSTEMS (3.4)

PROVIDE FLEXIBLE CLASSROOM-MANAGEMENT SYSTEMS (3.5)

DEVELOP INSTRUCTIONAL PLANNING AND SCHEDULING TECHNOLOGIES AND SYSTEMS (3.6)

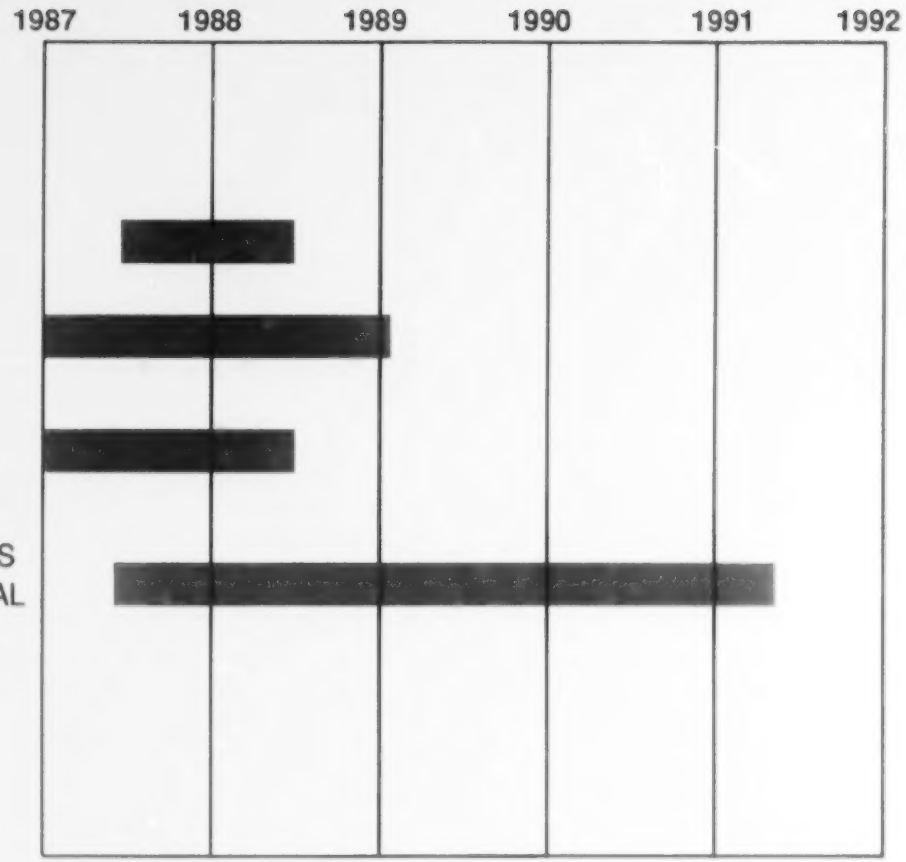
IMPROVE IMFORMATION ACCESS BY TEACHERS, ADMINISTRATORS, COUNSELORS, PARENTS, AND STUDENTS (3.7)

ENCOURAGE THE INSTRUCTION OF BASIC COMPUTER/ TECHNOLOGY LITERACY AT ALL LEVELS (3.9)



Strategic Plan: ETS (Page 5)

ADMINISTRATIVE NETWORK



DEFINE DISTRIBUTIVE PROCESSING GUIDELINES AND MODELS (4.1)

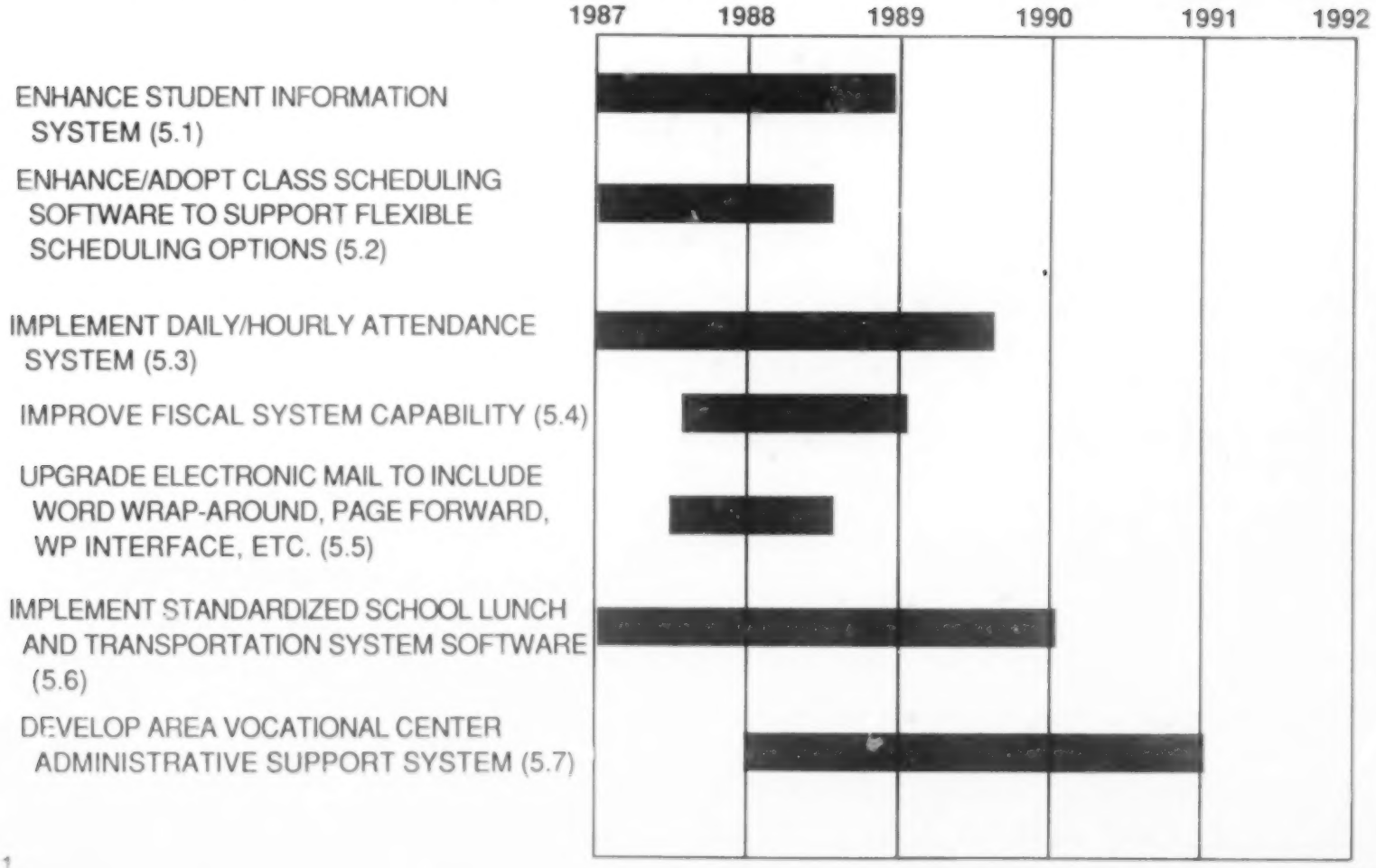
DEFINE AND DOCUMENT MULTIPLE SERVICE OPTIONS (4.2)

DEVELOP AND IMPLEMENT DATA BASE UPLOAD AND DOWNLOAD CAPACITY (4.3)

IMPROVE PRESENT NETWORK CAPABILITIES INCLUDING PROBLEM RESOLUTION, DIGITAL CIRCUITS AND HIGHER COMMUNICATION SPEEDS (4.4)

Strategic Plan: ETS (Page 6)

ADMINISTRATIVE SOFTWARE ENHANCEMENTS


1987
1988
1989
1990
1991
1992
ENHANCE STUDENT INFORMATION SYSTEM (5.1)
ENHANCE/ADOPT CLASS SCHEDULING SOFTWARE TO SUPPORT FLEXIBLE SCHEDULING OPTIONS (5.2)
IMPLEMENT DAILY/HOURLY ATTENDANCE SYSTEM (5.3)
IMPROVE FISCAL SYSTEM CAPABILITY (5.4)
UPGRADE ELECTRONIC MAIL TO INCLUDE WORD WRAP-AROUND, PAGE FORWARD, WP INTERFACE, ETC. (5.5)
IMPLEMENT STANDARDIZED SCHOOL LUNCH AND TRANSPORTATION SYSTEM SOFTWARE (5.6)
DEVELOP AREA VOCATIONAL CENTER ADMINISTRATIVE SUPPORT SYSTEM (5.7)

Strategic Plan: ETS (Page 7)

FUNDING

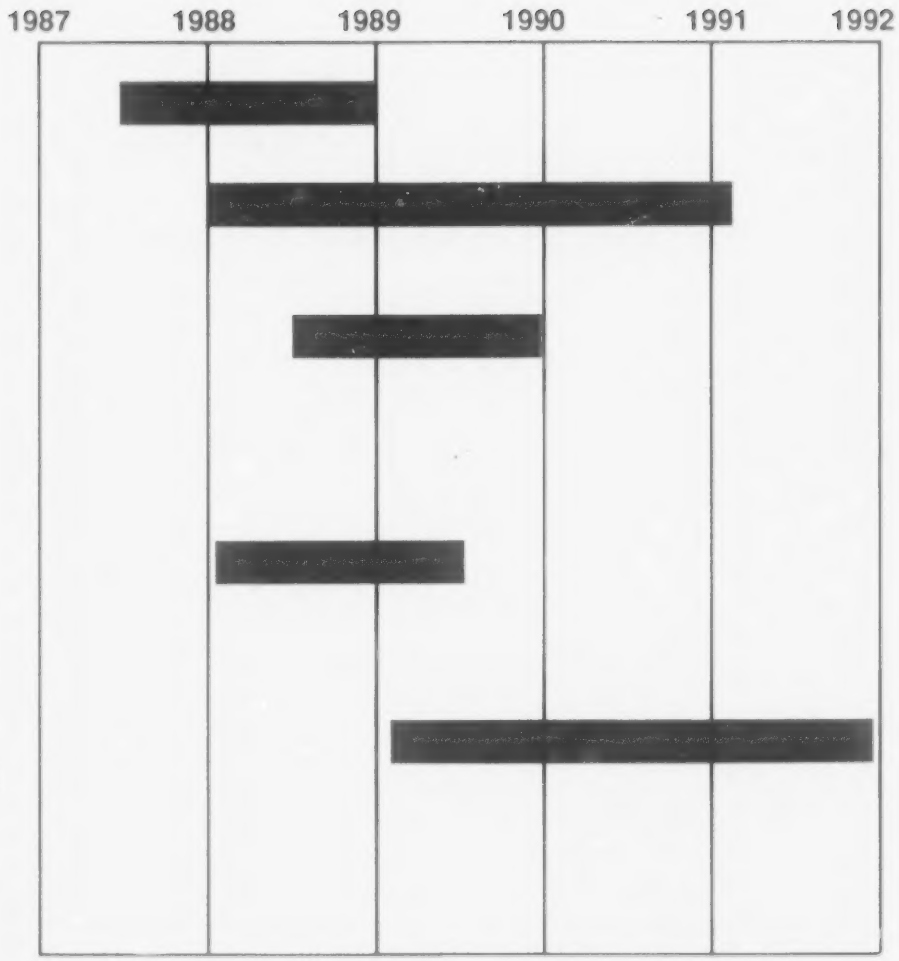
SEEK APPROPRIATE LEGISLATIVE FUNDING OF TECHNOLOGY (6.1)

DEVELOP LOCAL FUNDING REALLOCATION STRATEGIES AND GUIDELINES (6.2)

ESTABLISH DEVELOPMENTAL GRANT FUNDING LEVELS FOR TECHNOLOGY (6.3)

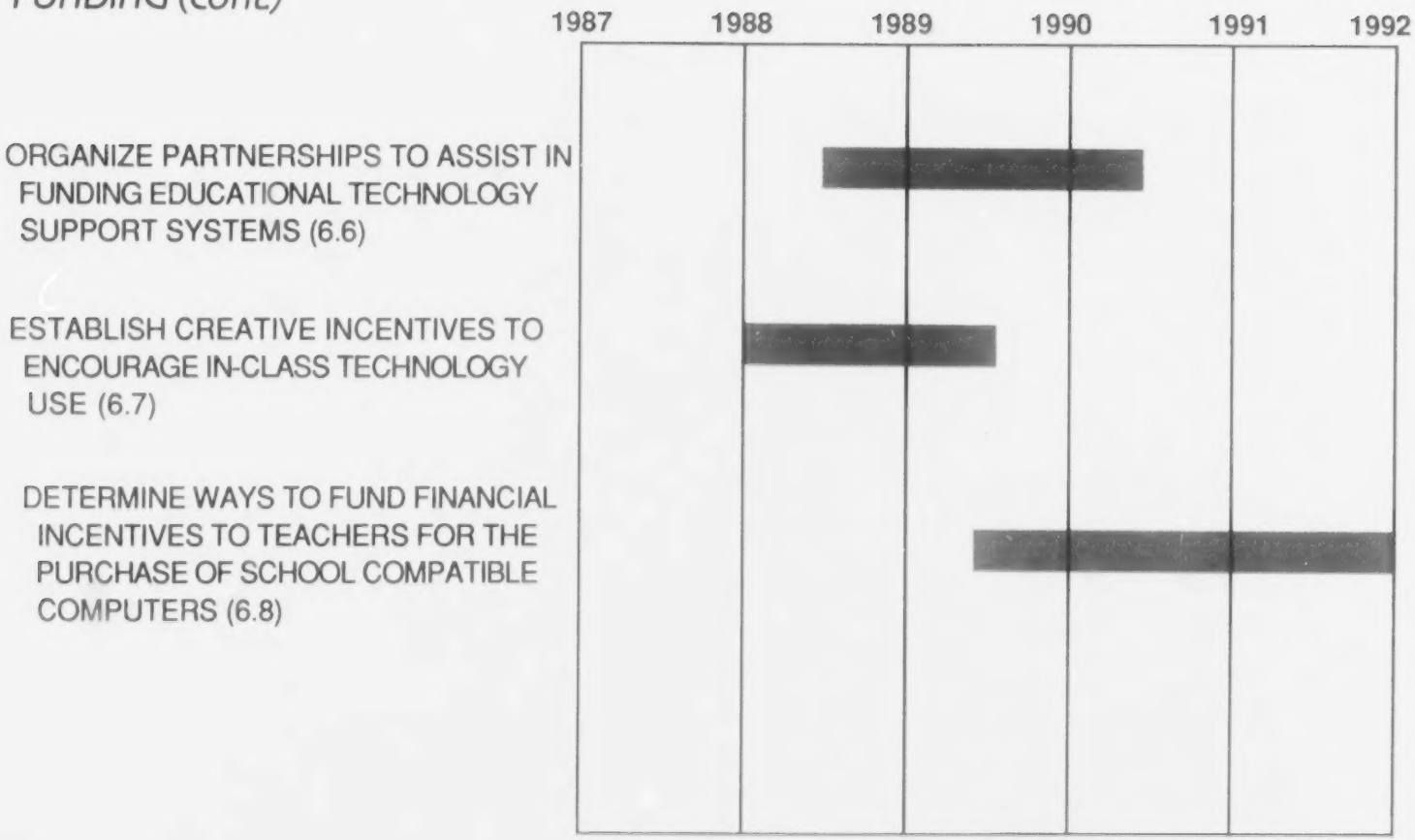
DEFINE GUIDELINES WHICH ENCOURAGE REPLICATION OF VALIDATED TECHNOLOGY PROJECTS (6.4)

COORDINATE DISTRICT PROPOSALS FOR NEW TECHNOLOGY APPLICATIONS WITH THE STATE EDUCATIONAL MASTER PLAN (6.5)



Strategic Plan: ETS (Page 8)

FUNDING (cont.)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ORGANIZE PARTNERSHIPS TO ASSIST IN FUNDING EDUCATIONAL TECHNOLOGY SUPPORT SYSTEMS (6.6)
ESTABLISH CREATIVE INCENTIVES TO ENCOURAGE IN-CLASS TECHNOLOGY USE (6.7)
DETERMINE WAYS TO FUND FINANCIAL INCENTIVES TO TEACHERS FOR THE PURCHASE OF SCHOOL COMPATIBLE COMPUTERS (6.8)

Strategic Plan: ETS (Page 9)

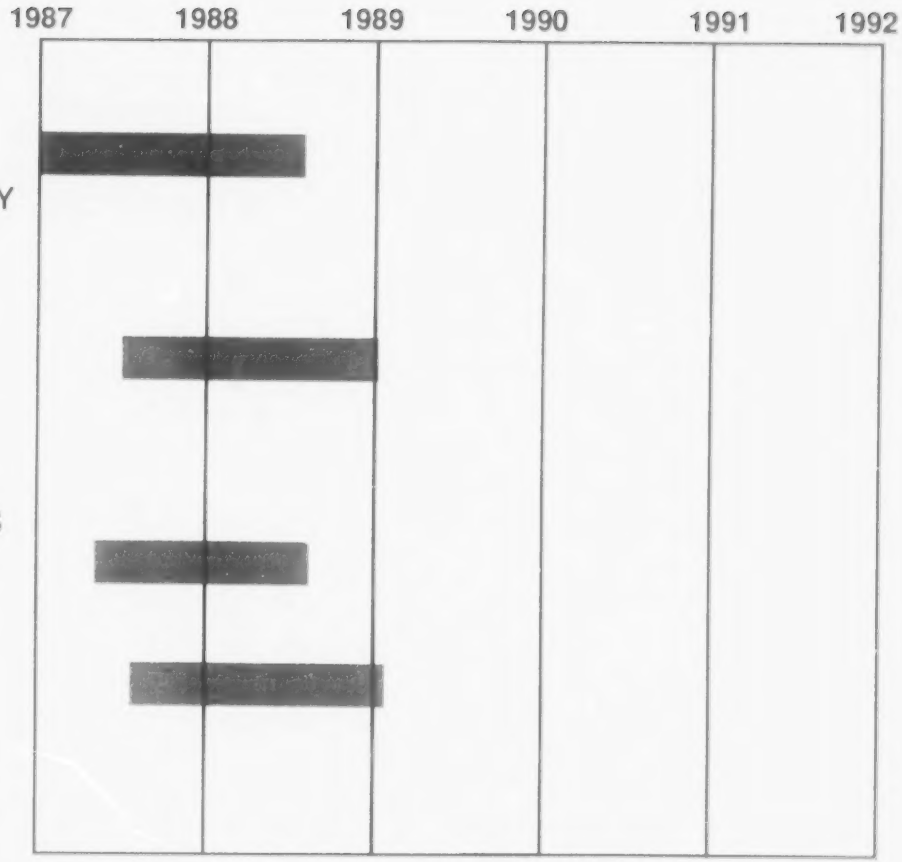
COST-EFFECTIVENESS

DETERMINE AND VALIDATE THE COSTS OF THE ADMINISTRATIVE AND INSTRUCTIONAL SERVICES PROVIDED BY UNES (7.1)

DETERMINE AND VALIDATE THE COSTS OF THE ADMINISTRATIVE AND INSTRUCTIONAL SERVICES PROVIDED INDEPENDENT OF UNES (7.2)

DETERMINE SIMILAR COSTS OF SERVICES PROVIDED IN OTHER STATES (7.3)

ESTABLISH CRITERIA FOR ACCURATE COMPARISONS (7.4)

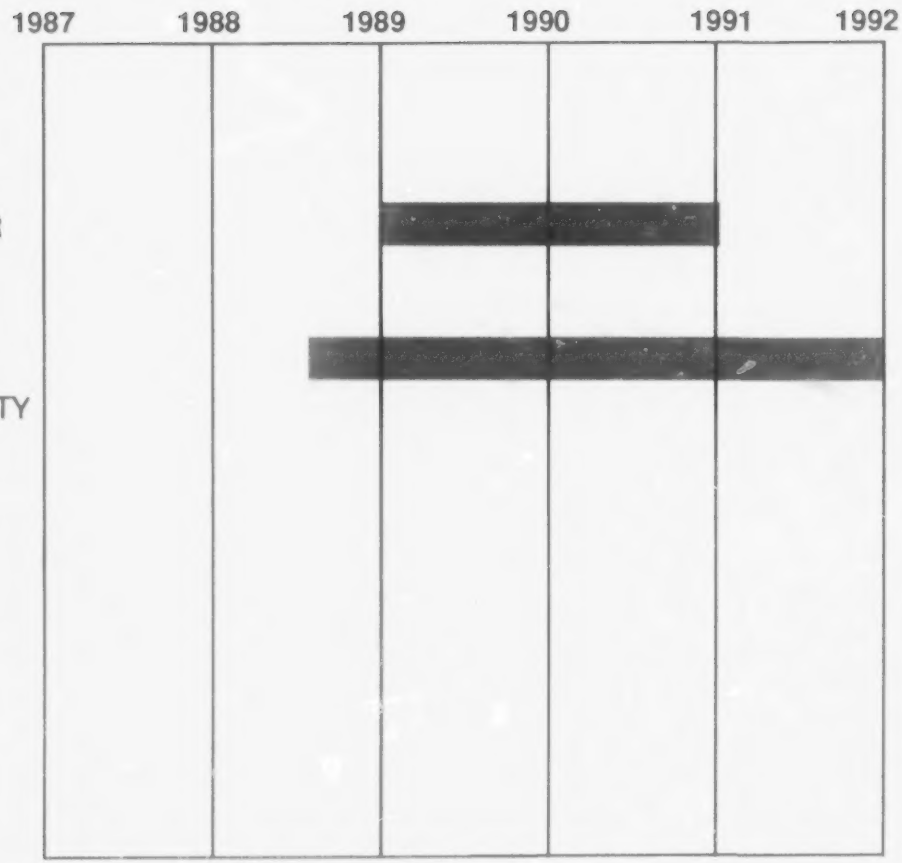


Strategic Plan: ETS (Page 10)

COST-EFFECTIVENESS (cont.)

DEFINE AND ADOPT THE MOST COST-EFFECTIVE SERVICE STRUCTURE AND/OR LEVELS FOR THE STATE (7.5 AND 7.8)

EXAMINE AND/OR DEVELOP NEW TECHNOLOGY USE TO ENHANCE OR IMPROVE COST-EFFECTIVENESS AND PRODUCTIVITY (7.7)



Section VI: Future Applications

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FUTURE APPLICATIONS

Technology tempts people to dream of many things they never before believed possible, as if the computer were a kind of fantasy machine. Nowhere else may its potentialities be more vast than in education, the merging of teaching and learning to produce human understanding.

But educational technology can only be as successful as those who apply it. It is a tool to be used with discrimination and with wisdom. Adding technology to powerless, mediocre instruction will not change the effectiveness of that instruction; adding it to excellent instruction will. Educators can use technology to nourish genuine creativity, to enrich the educational experiences of Utah's youth, or to place them more at risk than they would have been if no technology had been utilized at all.

Perhaps the most valuable thing Utah's administrators can do is to actively encourage their faculty to take time to explore what a computer can do, to devise their own methods to make the computer part of the adventure of learning for students. For every teacher who is given a secure opportunity to do this and the time to do it, creative ideas no principal, department head, district specialist, or curriculum director ever thought of will be born.

Technology and Educational Innovation for Today

Reduce Record Keeping–Increase Teaching Time

Properly conceived, the capacity of the computer can be used to open a way for teachers to collect more and better data, yet spend less time collecting it. While there are many very sophisticated potential uses for technology in education, the most relevant may be the collection and management of school-based information. Profiles and progress reports on groups and individuals would give teachers the kind of information necessary for making effective instructional decisions. This kind of objective-by-objective tracking is virtually impossible without the capabilities of the computer.

Adding technology to data collection and management will not only make use of data more likely. The quality of the information collected and the ability of the teacher to summarize and analyze it will be significantly enhanced. The positive impact on instructional decisions and the reduced amount of teacher time consumed in data collection will increase the quantity and quality of student-teacher contact time. The ability to reform the data-collection process exists now.

Alternative Teaching Configurations

The accusation that educators are harvesting by hand in an age of technology is aimed primarily at the insistence on placing one teacher in front of thirty students and never deviating. Technology is already permitting us to rethink the way we deploy professional teaching resources and to enhance the productivity of those resources.

There are teachers with unique talents who should share those talents with more students. There are subject-matter developments in areas of the curriculum with which it is impossible to stay abreast. Advances in video and computer technology can make the very best instruction available to every student . . . now. Opting to use technology in this way requires us to think about instruction in new ways. Here are just two options for redeployment of teachers into alternative instructional options:

Initial presentation of instruction could be made in a video presentation by a master teacher. What does the regular classroom teacher do? Actually there is much to do. The classroom teacher can provide pre-instruction orientation, assess student understanding, provide extensions and expansions, and provide remedial instruction.

Another option is the presentation by computer in what is known as Computer-Based Instruction. A computer program controls the presentation, making it possible to evaluate each student's response and make appropriate branching decisions in providing instruction in their area of greatest need. The professional teacher plays the same kind of integral role as the teacher in the video instruction example.

A high-quality, initial presentation can greatly enhance student motivation. High-quality follow-up can greatly facilitate student learning. More students can be served at once which increases cost-effectiveness.

Technology and Educational Innovation for Tomorrow

Interactive Video

The production of "living textbooks" is nearly a reality in the teaching field. The merger of outstanding teacher presentations, actual video presentations of examples, and the structuring of student interaction with content is just becoming available. Laser-disk technology permits the production of quality video which can be accessed frame by frame through a computer. Students can study a subject, see demonstrations or simulations, test themselves for facility with the subject, branch to helpful remedial instruction, and perform a wide variety of interactive tasks.

The Utah State Office of Education has already made history by joining the International Business Machines Corporation and Bonneville International to combine an accelerated-learning methodology, a satellite-dissemination system, and cooperative-learning techniques with computer technology in order to provide high-quality instruction in Spanish at remote, rural school sites. Other such partnerships between public schools and colleges and universities are being generated. This is only the beginning.

Information Concerns

In some school districts in our nation, every school is on-line to data bases on a variety of subjects, making current information readily accessible. Students can access the economic, social, and political information which would make report-writing an adventure instead of an exercise in copying the encyclopedia. Compact-Disk technology is available which makes it possible to store the contents of dozens of books on one disk which can be randomly accessed instantaneously.

Services will soon be available by which a computer user can access a software program through telecommunication . . . without being required to purchase the software. A school would rent a particular software program and pay only for time used. When the program is obsolete and new thinking has revised the whole approach to the subject, the new software would become available. The user need not throw out the old program and purchase the new, hoping that the new program will be more useful than the old.

Hypothetical Simulation

For the time being, simulation is a positive use of the technology. Simulations so mundane as scientific experiments, handling interpersonal difficulties, or building bridges or buildings on the computer will have far-reaching effects which likely could not be duplicated in traditional approaches. Simulations in history or geography are already available. Soon, scientific experiments will be simulated so that the mechanical work is done, freeing students to validate data, repeat experiments, or ask probing questions without exposing themselves to dangerous chemicals or other potential hazards.

Artificial Intelligence

Computer software is becoming so sophisticated that it can now create a model of its user and tailor the instructional presentations and experiences to the style of the user. Systems exist which permit the assignment of an advisor which tracks the student's progress and makes suggestions for branches to relevant experiences which would help the student along.

Never before have Utah's public schools been poised at so crucial a crossroads. The Educational Technology Study Committee offers its recommendations in the hope that our state will embrace the technological assets it possesses to assure that Utah's education system takes the road to its best, most promising future.

SECTION VII:
Study Implications and General Recommendations

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Introduction

This section includes a synthesis of the study's objectives, the implications which result from those objectives, and the recommendations which, if implemented, would accomplish that which is specified by the objective. This synthesis is intended to coordinate the original objectives of the study with the recommendations which were derived from the study and which are documented in Section III.

STUDY IMPLICATIONS AND GENERAL RECOMMENDATIONS

Objective #1

Design state-of-the-art technological models to be offered by the state to local districts.

Implications

There is a need for state-of-the-art models of technology application. These models should include all types of technology; represent options to local schools; and be efficient, effective, and equitable. Funding/incentive programs should be developed. Appropriate software/programs need to be available through purchase, development, or identification. Models should be available, conceptually and/or concretely, to all districts. Models must involve a balance of local application and networking considerations and be flexible and responsive to local needs. Decisions need to be made as to whether a model or models should be totally integrated at a few sites or parts of models be more widely dispersed. Application of model(s) should be a substantive part of the identification procedures for the Utah Model School(s) Project. Any model must have inherent in it the ability to grow, to change with needs, and to accommodate additional technological development. Models should include software, hardware, and training and other process issues.

Recommendations

- Purchase, develop, or evaluate instructional-management software for use of districts and state demonstration.
- Develop a portable technology demonstration center for purposes of inservice, training, and demonstration.
- Develop state and legislative budget support for minimal technology program in each district.
- Identify components and processes of technology models.
- Identify efficiency, effectiveness, and equity benefits of technology models.
- Identify statewide networking needs and requirements, as well as local options, and provide or identify models of such.
- Establish a statewide technology advisory committee to identify and modify model(s) suggestions.
- Integrate the State Office of Education's technology functions in order to better serve as a model itself.

- Purchase agreements for software and hardware should be negotiated at the state level for the entire state, where feasible.

Objective #2

Implications

There is a need to improve and enhance the present cooperative information technology network. These improvements should include modifications which will increase the speed of the data-transmission facilities, improve the reliability of the network, identify and improve components that are deemed unreliable or lack a level of acceptable reliability, utilize network-management facilities and tools to promote more rapid problem resolution, and provide network interfaces and gateways to national network capabilities.

This network facility forms the framework for educational information access for the home, classroom, and school. It must support Core curriculum, instructional courseware, assessment-item, and student-performance data bases.

The network should support programs for homebound students and adult learners and should include facilities to provide information via electronic bulletin boards.

A standard of hardware/software compatibility must be established and promulgated to assure network accessibility to the wide audience or appropriate users. Security issues must be defined to protect sensitive data from unauthorized access and inappropriate use.

Recommendations

- Prepare a plan to upgrade the present network to increase the speed of data communications.
- Install digital-service circuits to all locations that have digital service available.
- Implement Systems Network Architecture (SNA) to improve the reliability of the network-support system.
- Investigate, evaluate, and cooperate with the state of Utah Division of Data Processing in the sharing of high-speed digital circuits, network-management tools, resource and personnel, and network-design facilities.
- Upgrade currently unreliable or unstable network components.
- Implement national network gateways to The Source, Vocnet, Edline, Specialnet, and Westlaw, and others when identified.

- Develop data base-support capabilities to permit data base access, upload/download, on-line report generation, and spreadsheet interface.

- Define ways by which the network can facilitate access to Core curriculum strategies, instruction courseware, and assessment-item data banks.

- Develop structures and facilities which will permit network access by students, parents, teachers, and others from the home, school, and classroom.

- Establish security criteria and facilities such as an automatic "dial-back" feature to protect data from inappropriate use and access.

Objective #3

Develop a plan to integrate the use of technology in instruction and management, thereby improving the quality and cost-effectiveness of education.

Implications

There is a decided need for a forum to deal with technology and its applications in creative ways. This includes present technology and an anticipation of future developments. A constant assessment of the state-of-the-art and field testing is very critical to functional creativity. Linkages need to be developed with the researchers and the implementers. A plan for bringing known educational technology into all schools becomes a necessity in order to better meet their needs. Resources need to be developed, legislated, or reassigned to focus on the need for and benefits of educational technology.

A stronger focus needs to be given to instructional teaching and management. Inservice becomes critical to implementing any plans and should be carefully considered.

Instructional courseware, staff reorganization, management of student information, mastery, roll books, feedback to parents, media, testing--all should be included in a technology plan.

Recommendations

- Form groups to evaluate existing software and computer/technology applications and make recommendations. Pilot those applications, and make provisions for a process of evolving technology applications in the system, including Utah model schools. The use of technology to allow greater productivity, which may include differentiated staffing, should be part of these recommendations.

- Identify or develop instructional-management software, including test banks and tests, media correlation to outcomes, strategy correlation, student and class tracking, test scoring, etc; all need to correlate with

educational outcomes. Identify or develop software to report progress on outcomes to parents, eventually including strategies for remediation.

- Provide statewide contracted software to local districts in instruction and management.

- Develop a specific funding plan for state needs and incentives for local districts for implementation of educational technology. Funding plan may include legislation, incentives, grants, partnerships with business, purchase incentives, etc.

- Provide consultative services to districts as they develop their technology plans. Establish standards or guidelines for such plans.

Objective #4

Identify levels of technology awareness and training needed and develop a plan to meet the current and future training needs.

Implications

A way to maintain a current assessment of training needs must be established.

Awareness of the varying individual needs of staff as to content, preferred learning mode, type of instruction, level of training, time for training, location, and funding must be established and carefully considered in inservice design.

Creative ways, using technology, must be developed for providing long-distance and personalized training. Much training must be given leadership by the State Office, and it should empower local districts to provide local training. Assistance to local districts should take a variety of forms: telelearning, distance learning, technical assistance, videotapes, on-site training and application, etc. Commercially provided training should be encouraged and guidelines established, where possible. Partnerships with consultants should also be explored.

Recommendations

Work closely with Operations Division to:

- Develop and implement a procedure for identifying inservice needs.

- Design a flexible, responsive model for inservice and training.

- Train local district staff to implement an inservice model.

- Develop and/or identify inservice and training-support materials.

- Encourage commercial technology companies to develop inservice support in specific areas of greatest demand. Develop agreements with consultants for training.
- Train state staff to act as models and mentors in the uses of technology.
- Establish a Technology Assistance Center to do much of the above.
- Develop a three-year sequence for meeting training needs of State Office staff and local districts.

Objective #5

Analyze current and projected services provided through technology in order to develop a procedure to establish priorities for new and existing projects.

Implications

There is a need to improve coordination and cooperative efforts among the school districts and the USOE. There is some duplication of effort in systems development that could be appropriately coordinated. It is essential that all of the various public school entities of the state work together to maximize the efforts to develop and implement technological solutions to both administrative and instructional challenges. A process must be established which would permit the definition of an overall directional perspective and plan, the establishment of systems-development priorities, the brokering of various tasks to interested entities and available resource pools, and the designing of mechanisms to promote the sharing of completed projects. An additional need is to establish guidelines that encourage the development of systems that support both administrative and instructional applications and which could be implemented at the appropriate level (e.g., statewide, district, school, classroom) in order to minimize costs and maximize effectiveness and efficiency.

Recommendations

- Organize a group which would review systems-development needs and which would make recommendations regarding priorities. This clearinghouse function would assist in identifying needs, possible solution strategies, resource availability, implementation levels, and appropriate time lines for systems-development activities.
- Define procedures which will promote the "brokering" of certain systems-development activities and which would include appropriate incentives to those entities willing to assume the initial systems-development obligations.

- Identify mechanisms to promote and provide incentives to encourage innovative and creative systems solutions which take advantage of the constant and rapid advances in technological capabilities.

- Assign the responsibility to define a long-term, directional statement and planning process to permit and promote compatible and unified efforts in using technology in education. This plan must consider the many technologies which are available that can benefit education (e.g., computers of all sizes and capabilities, data-communication networks, and television and microwave facilities). The uses of these technologies must be merged together to maximize their potential, provide the levels of flexibility required to support a widely diverse set of users, and produce the highest-quality educational experiences and opportunities for students in the most cost-effective manner possible.

Objective #6

Identify financial and organizational requirements for implementing specified technological services and the benefits of these services.

Implications

There is a need to implement organizational structures that will provide a substantially improved level of opportunity and impetus for the various educational entities to collectively bring the necessary technological resources and solutions to "bear" upon the challenges that face the educator of today and of the next two decades. The problems that arise from the need to protect the principles of local autonomy and individual uniqueness must be tempered by the benefits of cooperative and collective problem resolution and solution implementation. There is a need to establish a greater degree of cooperation and reduce the feelings of competition. A set of financial considerations must be defined which more appropriately promotes cooperative and collective efforts in technological development. A procedure to identify and more carefully document the benefits of technological implementations must be defined. Assumptions regarding the advantages of using technology to assist education must be thoroughly investigated and the benefits documented before extensive implementations occur.

Recommendations

- Assign an ad hoc task force of USOE and district personnel to examine and recommend alternative organizational structures that will improve the opportunities to implement technology.

- Actively solicit involvement of local district boards of education, administrators, and staff in defining ways to ameliorate the problems attached to the attitudes of competitiveness and autonomy and generate cooperative efforts to provide technological solutions in education.

- Financial considerations such as grants, incentives, and/or pay-back options must be defined to fund technological systems development and promote cooperative system-wide implementations.

- A system for identifying the benefits of any suggested technological implementation must be defined and utilized. The benefits must be quantified in terms of cost-effectiveness, increased productivity, or improved quality and/or equity. A cost/benefit analysis must be prepared and should be submitted to the group charged with the clearinghouse function discussed in Objective #5.

Appendix A

UTAH STATE OFFICE
OF EDUCATION

James R. Moss
State Superintendent of Public Instruction

UTAH STATE BOARD OF EDUCATION
UTAH STATE BOARD FOR VOCATIONAL EDUCATION

Keith T. Checketts/Chair • Ruth Hardy Funk/Vice Chair
Neola Brown • Donald G. Christensen • John M. R. Covey
Darlene C. Hutchison • Valene J. Kelson
M. Richard Maxfield • Margaret R. Nelson

M-E-M-O-R-A-N-D-U-M

TO: **ALL SCHOOL DISTRICT SUPERINTENDENTS**

FROM: James R. Moss, State Superintendent

DATE: May 22, 1987

SUBJECT: **APPLICATION TRANSFER STUDY TO BE CONDUCTED BY THE STATE OFFICE OF EDUCATION AND I.B.M.**

One of the major educational reforms we hope to accomplish in the state of Utah in the next several years is better utilization of technology in both our instructional and administration areas. I know many of you are working very vigorously to utilize technology better in your district offices as well as in school offices and in the classroom. The State Board of Education has made this one of their priorities as well and, as you know, we have done several things in recent months and years to encourage and facilitate increased utilization of computer-assisted instruction as well as use of technology for better financial and personnel administration.

To help in this endeavor, the State Office of Education is embarking on an intensive six-week study of the use of technology in education in the state of Utah. We are doing so in partnership with I.B.M., who has conducted similar studies in several other states and in many school districts across the nation. Dr. Kolene Granger will be chairing the effort from the State Office, and several people from the State Office staff as well as a number of people from school districts and individual schools that will serve as members of the task force. We anticipate a fairly intensive involvement on their part for the next six weeks, but are confident that it will be a great investment in gaining important information of what possibilities are available for technology utilization in education.

My purpose in writing to you is to announce the study and to indicate that in the near future you will be contacted by the State Office and asked to identify the names of principals, teachers, and counselors whom you would recommend we could interview for this study. Additionally, you personally may be interviewed, as well as your business manager or clerk. It is the desire of the study to be thorough and balanced so that we will have adequate representation from urban and rural districts, large and small districts, those already extensively utilizing technology, and those who are just beginning to utilize it more.

We will appreciate your assistance as called upon to help us conduct this study. You should be aware that IBM is doing this with no commitments for any financial remuneration or hardware or software sales. It is obviously in their best interest however to work with us, and certainly it is in ours to gain the information on possibilities that we might be able to utilize through their company for our schools.

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250 East 500 South / Salt Lake City, Utah 84111 / (801) 533-5431

I am asking for your full cooperation with this study as you are called upon by members of the task force. The report that will be prepared from the study will be presented to the State Board for their consideration. Copies will also be made available to districts as requested so that you might be able to benefit from the recommendations that will be made by the task force. I am confident that we will have some excellent suggestions come from the study and that it will be well worth the time and effort involved by all concerned to find ways to better utilize technology in our programs.

JRM:b

Appendix B

ATS PLANNING SESSION ATTENDEES

April 20, 1987

Place:

IBM — 8:00 a.m. - 5:00 p.m.
Room #265

USOE

Sperindentent Moss		
Scott Cameron	-	Assistant Superintendent
Carol Clark	-	AA to Governor
Bob Leake	-	Assistant Superintendent
Bruce Griffin	-	Associate Superintendent
Judy Dewaal	-	Controller

D.P.

George Brown	-	D.P. Manager
John Flagg	-	Manager - Systems Services
Chuck Cummins	-	Manager - Marketing Services
Del Atwood	-	Management Services Coordinator

LEG

Richard Bradford	-	House Appropriations Committee

IBM

Richard Johnson	-	ATS Specialist
Amy Bradshaw	-	Marketing Representative
Rob Peterson	-	Systems Engineering Manager
Dane Goodfellow	-	Marketing Manager
Lee Roberts	-	Branch Manager
Vern Whisenant	-	Marketing Representative
Jay Blydenstein	-	Education Specialist
Dan Watanabe	-	Marketing Representative
Earl Fegely	-	Marketing Representative

Appendix C

Methodology

The methodology used by IBM to conduct similar Application Transfer Studies was employed by the team in conducting the Educational Technology Study commissioned by Superintendent Moss. The steps as defined by this methodology include the following:

1. **Define the mission and goals of the study.**

2. **Organize the study team.**

3. **Design a comprehensive survey document that would be used to gather significant and relevant data regarding the present and future uses of technology in support of education.** (See Appendix B)

4. **Solicit local administrative support. This local commitment would be essential, inasmuch as many local district/school staff members would be asked to complete the survey document and to be interviewed by the study team.**

5. **Define the interview schedule and select the appropriate participants.** The interview list comprised a very broad range of interviewees including USOE staff, three groups of superintendents, three groups of business officials, three groups of principals, and three groups of teachers/counselors. Also included were the data processing managers from the large school districts in the state who operate independent data processing systems.

6. **Conduct the interviews and gather survey data and information.** In total, there were over 100 individuals interviewed during a 3-week time period. Interviews were conducted in Salt Lake City, Cedar City, Richfield, and Ogden. Interviews lasted approximately one hour, and each team member took extensive notes regarding the answers to the interview questions posed by the team leader. Additionally, each interviewee was asked to complete a survey document (see Appendix B) which included the opportunity for the respondent to provide in-depth information regarding the uses (present and future) of technology in education.

7. **Data analysis.** The information gathered from the interviews was analyzed and tabulated into four major areas: Problems, Recommendations, Benefits, and Future Needs. The team prepared various charts which include the number of times a problem, recommendation, or benefit was mentioned and the number of interview groups that mentioned a particular item. These charts are included in the section on "Current Environment."

8. **Team analysis.** The data previously analyzed was reviewed and a set of statements regarding the problems, recommendations, and benefits that had been identified by the interviewees and which the team collectively defined as representative of the issues involved was prepared.

9. **Prepare specific directions and plans.** The final step of the methodology is to prepare the report which will include the specific directions and plans for implementing and utilizing technology in the educational process in the state of Utah.

Appendix D

Guiding Principles

As background, and in order to establish a set of criteria that would form a foundation from which to work, the following set of guiding principles was used:

1. Technology can greatly assist the instructional and administrative processes.

2. Standardized software and support should be used throughout the state in order to reduce duplicative development and limit costs.

3. Access to the facilities of the Utah Network of Educational Systems (UNES) should be available at all levels.

4. Systems should be developed to allow for several levels of implementation models from which districts may choose.

5. Facilities to upload and download data bases must be available.

6. Applications must be cost-effective.

7. It is more important to be collaborative than competitive.

8. Districts should not be penalized because of size or geographic locations.

Appendix E

INTERVIEW SCHEDULE
Thursday, June 11, 1987
USOE

8:30 a.m.

Mike Garbett
Doug Bates
Kay Haws
Art Bishop
Judy DeWaal
Linda Morrison

10:30 a.m.

Richard Keene
Bob Ives (out of town; will send Gloria Bowman)
LeRoy Lindeman
Carl Jensen
Brent Gubler
Max Jensen

1:00 p.m. - AVC Vocational Center Directors

Richard Maughan, Bridgerland AVC
Jack Shell, Davis AVC
Brent Wallis, Ogden/Weber Vocational Center
Dewain Washburn, Sevier Valley Tech and AVC
Keith Bergquist, Uintah AVC

3:30 p.m.

Annette Moore
Char Pierce
Ethel-Lee Jensen
Chuck Cummins
Dean Bradshaw
Roger Mouritsen
Blaine Petersen

INTERVIEW SCHEDULE
Friday, June 12, 1987
East Board Room

8:00 A.M.
Superintendent John Reed Call
Devon Sanderson
Superintendent John Bennion
Superintendent Richard Kendell
Superintendent William Garner
Harold Trussel (Principal)

10:00 A.M.
Tamara Lowe
Diane Hesleph
Ted Lovato
Jose Trujillo
Burgess Robinson

1:00 P.M.
Dave Lundstrom
Dennis S. Gilbert
Anne Harker
Frank Fenlon
Karen Mietchen
Roger Glines

3:00 P.M.
Mr. Sherron Porter
Joe Wilde
Roy S. Stout
Dave Garrett
(Ms.) Mavis Collett

INTERVIEW SCHEDULE
Thursday, June 18, 1987

Iron County School District Board Room

9:00 - 10:00 a.m. (Business Manager/Clerk)

Nicholas Dotson (Beaver)
Kent Peterson (Iron)
Robert Steele (Millard)
Ronald McArthur (Washington)
Tom Willardson (Kane)
Superintendent Ralph Starr* (Kane)

10:30 - 11:30 a.m. (Teacher/Counselor)

Tim Lowe (Washington)
Harold Shirley (Iron)
Madalyn Bennett (Millard)
Mary Ann Bentley (Iron)
Sandra Benson (Iron)
Tom Walker (Iron)

Sevier School District Board Room

1:00 - 2:00 p.m. (Superintendents)

John Carl Tuft (Sevier)
Kirk L. Wright (Juab)
Willard D. Bass (Wayne)
Jack Burr (Central Utah Educational Services)
Lewis Mullins (South Sanpete)

2:30 - 3:30 p.m. (Principals)

Boyd Keisel (Sevier)
Norman Wall (Juab)
Glenn Partridge (Sevier)
Ivan Rowley (Sevier)
Wayne Crook (Beaver)
Lynn McArthur (South Sanpete)

* Superintendent Starr asked to attend this session in Cedar City rather than the Richfield session because it is closer to his home.

INTERVIEW SCHEDULE
Thursday, June 25, 1987

Mound Fort Jr. High Media Center (Ogden) (1396 Mound Fort Avenue; just off 12th Street at 850 East)

9:00 - 10:00 a.m. (**Business Officials**)

Dale Hansen (Logan)
Bill Sampson (Park City)
Demont Lott (So. Summit)
Scott McMichael (No. Summit)
Larry Tesch (Ogden)
Paul Jensen (Box Elder

11:00 - 12:00 noon (**Principals**)

Superintendent Darrell White (Box Elder)
Vaughn Larson, Asst. Principal (Morgan)
Vern Call (Ogden)
Clark Ballard, Counselor (Logan)
Bob Jensen (Box Elder)
Vida Gines, Asst. Principal (Cache)

1:00 - 2:00 p.m. (**Teacher/Counselor**)

Willa Hurd (Box Elder)
Rhea Wallentine (Logan)
Keith Taggert (Cache)
Janice Olsen (Box Elder)
Ann Miller (Weber)

INTERVIEW SCHEDULE
Friday, June 26, 1987

Park City Olympic Hotel (formerly Ramada Inn) - 1895 Sidewinder Road (Turn left at the Yarrow, continue on to 7-11, and turn right; it is the first hotel.)

7:30 - 8:30 a.m. (**Superintendents**)

Henry Jolley (Wasatch)
Ron McIntire (Park City)
Fred Openshaw (Tintic)
Hal Jensen (San Juan)
Ell Sorenson (Carbon)
Jerry Peterson (North Summit)

INTERVIEW SCHEDULE
Tuesday, July 7, 1987 - Salt Lake City
Utah State Office of Education - East Board Room
10:00 - 11:00 a.m.

Data Processing Managers

Frank Cameron (Alpine)

Ron Beckstrom (Granite)

Gary Smith (Salt Lake)

Dick Lemon (Davis

Dale Schimmelpfennig (Weber)

Curtis Webb (Provo)

Appendix F

EDUCATIONAL TECHNOLOGY STUDY

I. Name_____ Position/Title_____
(optional)
School District_____

Below is a list of services being utilized in the school districts of the state of Utah. Please indicate the source(s) of the following technological services which you use on the left side of each item:

U = USOE Cooperative Network S = Local School A = Service Available
D = District N = Service Not Available But Not Used

Please indicate your satisfaction with the services on the right of each item:
5 = High Level of Satisfaction to 1 = Low Level of Satisfaction

Source of Service	Satisfaction Level (High Low)
Student Services	
_____Student Information System (SIS)	5 4 3 2 1
_____Grade Reporting	5 4 3 2 1
_____Standardized Test Scoring	5 4 3 2 1
_____Attendance Accounting	5 4 3 2 1
_____Class Scheduling	5 4 3 2 1
_____Competency-Based Testing	5 4 3 2 1
_____Special Education	5 4 3 2 1
_____Youth In Custody	5 4 3 2 1
_____Vocational Guidance (e.g., GIS, Discover)	5 4 3 2 1
Fiscal Services	
_____Payroll	5 4 3 2 1
_____Budget General Ledger	5 4 3 2 1
_____Accounts Payable (Purchasing)	5 4 3 2 1
_____Fixed-Asset Inventory	5 4 3 2 1
_____Warehouse Inventory	5 4 3 2 1
_____Personnel Services	5 4 3 2 1
_____Food Services	5 4 3 2 1
_____Transportation (bus routing)	5 4 3 2 1
Special Services	
_____Electronic Mail/E-Mail	5 4 3 2 1
_____Word Processing	5 4 3 2 1
_____National Network Data Bases (e.g., Ednet, SpecialNet, VocNet, Compuserve, The Source,)	5 4 3 2 1
_____Information Storage	5 4 3 2 1

Source of Service	Satisfaction Level (High Low)
Personnel Services	
_____Teacher Certification	5 4 3 2 1
_____Substitute Mgmt.	5 4 3 2 1
_____Inservice History	5 4 3 2 1
Operational Services	
_____Training	5 4 3 2 1
_____Control and Data Input/Output	5 4 3 2 1
_____Data Entry	5 4 3 2 1
Instructional Services	
_____Classroom Mgmt.	5 4 3 2 1
_____Instructional Mgmt.	5 4 3 2 1
_____Computer-Assisted Instruction	5 4 3 2 1
_____Data Base Services	5 4 3 2 1
_____Media Bank	5 4 3 2 1
_____Test-Item Bank	5 4 3 2 1
_____Satellite Learning Project (DALP)	5 4 3 2 1
Other	
_____ _____	5 4 3 2 1
_____ _____	5 4 3 2 1
_____ _____	5 4 3 2 1
_____ _____	5 4 3 2 1
_____ _____	5 4 3 2 1
_____ _____	5 4 3 2 1

Hardware Please indicate the type(s) of hardware that you use:

Mainframe/Terminal ☐ Microcomputer ☐ Other ☐

II. Please use the following space to make comments about some of the items you checked. What is it that you like about the type of information? How does it help you do your job better? What is it you don't like about the information, or your access to that information?

Type of Information (checked on p. 1)	Comment
examples:	
a. Class Lists	It takes too much of my time to continuously rewrite class lists when schedules are changed.
b. Personnel	PRF process takes too long. It takes too much time to get staff on board.
1.	
2.	
3.	
4.	
5.	
6.	

(use other side, if necessary)

III. What is your current job assignment? _____

A. Administrative and/or Technical

1. If you have administrative and/or technical responsibilities, what problems do you experience related to information/ communication needs?

(please check)

___ access to information/equipment
___ timeliness of information
___ confidentiality/security of information
___ lack of awareness/training
___ accuracy of information
___ usability of information
___ duplication of effort
___ other: _____

2. Which of the above problems do you think have a technological solution?

3. How are you using technology in your current responsibilities?

4. Comments:

B. Instructional

1. If you have instructional responsiblities, what problems do you experience related to information/communication needs?

(please check)

___ access to information/equipment
___ timeliness of information
___ confidentiality/security of information
___ lack of awareness/training
___ accuracy of information
___ usability of information
___ duplication of effort
___ other: _____

2. Which of the above problems do you think have a technological solution?

3. How are you using technology in your current responsibilities?

4. Comments:

(Use reverse side of sheet if more room is needed.)

IV. Administrative Recommendations

Benefits

How could technology improve your area of responsibility (e.g., quality, cost effectiveness, and equity)?

Training Procedures

What procedures do you recommend for inservicing staff members in technology?

Hardware/Software Needs

What are your suggested hardware/software needs?

V. Instructional Recommendations

Computer-Assisted Instruction **Benefits**

How could technology improve your area of responsibility (e.g., quality, cost effectiveness, and equity)?

How could technology assist in improving instruction (e.g., interactive, distance instruction, problem-solving)?

Which subject areas would benefit the most from technological assistance?

Instructional Management

What would you like to have in an instructional-management system?

Training Procedures

What procedures do you recommend for inservicing teachers in technology?

Hardware/Software Needs

What are your suggested hardware/software needs?

VI. Additional Comments

Please provide any other comments regarding technology in education (e.g., funding sources, decision process for purchase, instruction process for computer literacy).

Appendix G

QUOTABLE QUOTES

"Inservice training should be in basic skills only. Once in place, could add other areas for a targeted population."

"Computer technology is very valuable. The problem is that those who control the money remain computer-illiterate."

"Students who are able to learn programming tend to be better problem solvers."

"Because of technology I can respond quickly to changing conditions. I can also provide data, reports, and projections that are based on the latest information and that are generally free from common human error. It has enhanced the credibility of my position and of the district."

"First of all, 'technology' needs to be defined in a broad way, and the specific knowledge and skills for job-specific personnel need to be identified as well as a general overview of how 'technology' can make us more productive."

"We are finding more and better ways of using technology; however, we are still in the exploratory stage. Overall, there is a huge time investment going in, but the added data and ease of data recall is great!"

"We could use our best teachers to serve more kids."

SURVEY COMMENTS

"Computers have been outstanding in helping me get operational."
(Administrative Assistant)

"I have the notion that much of my work could be made easier with the appropriate hardware and software."

"I need intensive and extensive inservice workshops which focus on my own area of work (not the general for-everyone kinds of information sessions)."

"With the proliferation of hardware and software being peddled and marketed by diverse personnel and vendors, technology problems will intensify and costs escalate. Unless some direction is forthcoming to stifle this proliferation, monies will be expended for inferior products and school districts will tend to 'reinvent' the wheel, one at a time. Guidelines and plans must be followed to circumvent this from happening." (Max Jensen)

"Need more specific statewide criteria on use of resources in purchase and development of technology. Districts cannot communicate with other systems because everyone wants their own system."

"I spend about 50 percent of my time on a computer."

"We have classroom computers in computer classes, but we need them in the solid academic classes, as well."

"The assumed definition of technology seems to revolve around computers and telephones. It needs a much wider definition."

"Computers would free our best teachers to serve more students."

"I am aware that we are faced with staff and resource reductions; nevertheless, there is a cry to use technology to assist in filling this void. In order to accomplish this goal, the department of data processing at USOE will need staff increases and equipment increases in order to handle the demand. We cannot possibly hope or expect to meet the expectations from technology if we are to sustain staff reductions, reduced budgets, and no increases in equipment and other resources. There are many key people in the data processing department that must have salaries that are competitive with industry. We cannot continue to freeze salaries without the loss of our best people on the staff. Replacement of some key people will take many years to recover the equivalent competent level. We must operate like a business. Competitive edge is critical to the survival of data processing services we currently provide, in addition to the increased demand for services."

"Technology must result in productivity. Productivity includes the reduction in M & O costs over the years. Help is needed to analyze all the ways M & O can be reduced by technology. This needs to be a major effort to get past the obvious uses and savings and to develop very creative uses. Recent state productivity conferences are a beginning, but persons involved are too busy presenting their projects to really review, discuss, compare, brainstorm.

Appendix H

UTAH STATE OFFICE OF EDUCATION
EDUCATION INFORMATION TECHNOLOGY STUDY
June, 1987

INTERVIEW QUESTIONS

The state is in the process of developing a technology plan to address future information-processing needs. We are looking for any specific needs and suggestions that you think should be considered in this plan.

1. What problems, as they relate to the processing of information, do you experience in the performance of your area of responsibility?

2. Have you recommendations for improving the efficiency of processing information in your area of responsibility?

3. Of the recommendations you just made, which one would you place as the highest priority?

4. If your recommendations were implemented, what specific value or benefits would be realized by students, your school, or the district? the state?

5. As you look creatively into the future, and your job needs change, what additional information and services will be needed? This is your wish list!!

6. Are there are other comments you would like to make that were not covered by either the questionnaire or this interview?

Appendix I

UTAH STATE OFFICE
OF EDUCATION

James R. Moss
State Superintendent of Public Instruction

UTAH STATE BOARD OF EDUCATION
UTAH STATE BOARD FOR VOCATIONAL EDUCATION

Keith T. Checketts/Chair • Ruth Hardy Funk/Vice Chair
Neola Brown • Donald G. Christensen • John M. R. Covey
Darlene C. Hutchison • Valerie J. Nelson
M. Richard Maxfield • Margaret R. Nelson

June 9, 1987

Tamara Lowe
1698 East 2600 North
Layton, Utah 84041

Dear Tamara:

The Utah State Office of Education is currently engaged in an Information Technology in Education Study. This study will provide the information necessary for the development and implementation of an integrated information technology system in the classroom, schools, districts, and state. Its importance is stressed by the enclosed letter from State Superintendent Moss.

In order to gather information to complete the study, you have been selected, along with more than 100 other educators, to participate in providing critical data. We need the benefit of your experience and knowledge.

Please complete the enclosed questionnaire and bring it with you to a follow-up interview that will be held with five other participants and the team as per the schedule listed below. Travel expenses will be reimbursed.

If you have any questions, please feel free to telephone me at 533-5888.

Sincerely,

Kolene F. Granger
Associate Superintendent
Office of Development

jb

encl.

Interview

Date Friday, June 12, 1987
Place Utah State Office of Education
East Board Room
Time 10:00 a.m.

Note: You will be contacted to reconfirm this interview. Please contact me if there are any immediate problems.

250 East 500 South / Salt Lake City, Utah 84111 / (801) 533-5431

END

U.S. Dept. of Education

Office of Education
Research and
Improvement (OERI)

ERIC

Date Filmed

March 29, 1991